REGIONAL PATTERNS OF AGRO - INDUSTRIALIZATION IN WESTERN UTTAR PRADESH

DISSERTATION

SUBMITTED FOR THE DEGREE OF

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IN

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BY

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C E R T I F I C A T E

This is to certify that Mr. Anil Kumar has completed his dissertation entitled "***REGIONAL PATTERNS OF AGRO-INDUSTRIALIZATION IN WESTERN UTTAR PRADESH***" for the award of the M. Phil. degree under my Supervision.

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Reader

Date : 15.1.92

C O N T E N T S

A C K N O W L E D G E M E N T

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CHAPTER - 1
INTRODUCTION

India has been an agrarian country since down of millennia. But it is only during mid-seventies that . for the first time, witnessed great achivements in agricultural sector. Prior to that this mainstay of life was not in good shape. Traditional methods of agriculture yielded only limited agricultural production, as a result he had to depend even for foodgrains on the imported food-stuffs till Mid-seventies. Agriculture faced, as it still faces today a host of socio-economic and administrative problems. The size of holding has been uneconomic disallowing the modern methods of cultivation.

Green-Revolution has, however, started yielding results and India is now self-sufficient is foodgrains. Since mid-seventies the production of foodgrains has touched the figure of 178 million tones for the current year. This is the result of advancement in agricultural research and extension and also of the increased awakening of farmers and peasents to adopt modern technology in agriculture.

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It is widely felt now that industrialisation is extremely important for India's economic growth. There are proved reasons to be belived that unlike agriculture. industry has tremendous potential of increasing production. The reasons of possibilities of raising production are manifold. One reason is that industrial production process is less controlled by natural calamities of floods or droughts. Secondly they have the advantage of economics that are gained from increasing the scale of production, known as the economies of scale. Thirdly, each industrial unit also gaines benefits from the already developed infrastructure of roads, power line and other amenities required.

Industrialisation has to spread in India along the whole South by 'trickling - down process' as conceived by Hirshman[1] and also that India (needs) accelerating the rate of industrialisation to manage bread and butter for her teeming millions.

The industrilisation process in India is multi-dimensional. Geographers take care of this multi-dimensional aspects. It is of great contemporary importance to study industrialisation and plan industrialisation of India where the issue has so many problems. In recent decades geographic studies are increasingly focussing on the issue of industrialization.

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1. Hirshman, Albert, O., (1958):*The Strategy of Economic Development* New Haven, p.190.

Geographic study of industrialisation mainly takes into account the investigation of the spatial pattern of industrialisation in order to understand the process and forces in operation in developing parts of the world. Regional dimension of industrialisation should be studies taking various levels. This should help in understanding the spatial industrialisation which in turn should be utilised for industrial planning and economic development of the country. It is with this view that the present problem of study has been taken up in Muzaffarnagar district of Western Uttar Pradesh.

STATEMENT OF THE PROBLEM:

In a developing economy there is a need to develop agriculture and industrial sectors for a successful assault on poverty and unemployment problems.The agriculture-industry relation has featured prominently in economic theory since its early begginings in classical potiential economy. Agriculture sector is far behind in the pace of development in comparison to other sectors of the economy. particularly in developing countries becauseit is not as integrated as other sectors with its concerned developmental activities. The forward and backward linkages of agriculture are so disintegrated among themselves that agriculture seems to be an isolated rural activity practised in subsistant nature in most of the parts of India making a large number of its dependent population under-employed, resulting into

pushing its below poverty-line. Aprogressive farmer has to run occasionally to nearby urban centres in support of farm and non-farm activities due to poor integration of agriculture with industry.

Rural development is conditional with the expansion of agro-industrial activities and a substantial decline in the depedent farm population. Even if the conditions are favourable for agriculture. Simply. increasing agricultural efficiency and productivity will not result into rural development. Therefore.rural industrialisation is essential for un-utilized labour forces in rural areas. Apart from raising the income level of living of the rural poor, it will strengthen backward and forward linkages with agriculture. thus promoting a closer integration of agriculture and industry.

Rural industrialisation is the most effective means of stablishing the agricultural income and makes it rise steadily but such steps are unfortunately not within the purview of agricultural policy. Secondly, it is also observed that labour force in non-farm activities is better paid than in agriculture because industrial production process in rural areas, operates with a higher capital and hence, higher wages are not problem for the producers.

Rural industrialisation based on agriculture may concerate either on processing of agricultural products (forward linkage) or on fabrication of inputs for

agriculture (backward linkage). Such type of industrial pattern will strengthen farward and backward linkages required for agricultural development. It also provides more renumerative and modernising occupations to the rural poor.

Both agriculture and industry are since-qua-non for an economy as two wheels of a cart. Agriculture is the principle source of food and livelihood. It also provides sufficient raw materials for various industries. The development of agriculture undoubtedly promotes secondry and tertiary activities. But the development of agriculture is not totally for the industrial development. Only in the state of surplus agriculture produce, there are immense prospects for agro-based industries. It does not mean that without surplus agricultural produces, industry can not take place. In the case of sugar industry, the total sugar cane crop of any district is an industrial crop. It provides scope for sugar, (jaggery) and khandsari, molasses, wine making alcohal, chemical and paper industries. On one hand industries based on sugar-cane crop, raise per capita income of farmers and provides employment opportunities among the rural masses on the otherr hand. It is an industrial cash crop and requires adequate and efficient system of infrastructural facilities. Hence industry and its associated components must be integrated with agricultural production. Agro-industrial centre (Agrindus) can promote for the development of the agricutural and industrial

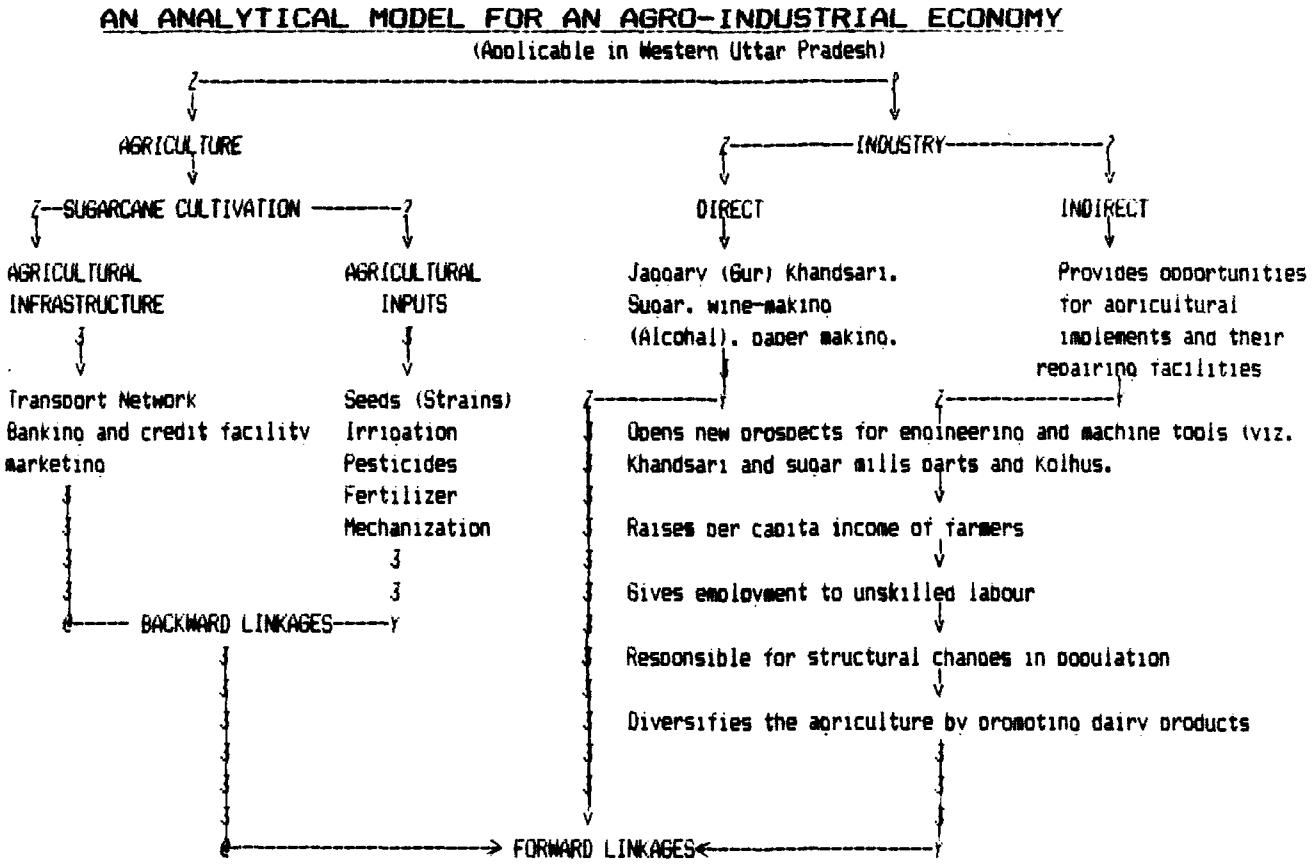
AN ANALYTICAL MODEL FOR AN AGRO-INDUSTRIAL ECONOMY
(Applicable in Western Uttar Pradesh)
AGRICULTURE
INDUSTRY
SUGARCANE CULTIVATION
DIRECT
INDIRECT
AGRICULTURAL INFRASTRUCTURE
AGRICULTURAL INPUTS
Jaggary (Gur) Khandsari, Sugar, wine-making (Alcohal), paper making.
Provides opportunities for agricultural implements and their repairing facilities
Transport Network
Banking and credit facility
marketing
Seeds (Strains)
Irrigation
Pesticides
Fertilizer
Mechanization
Opens new prospects for engineering and machine tools (viz. Khandsari and sugar mills parts and Kolhus.
Raises per capita income of farmers
Gives employment to unskilled labour
Responsible for structural changes in population
Diversifies the agriculture by promoting dairy products
BACKWARD LINKAGES
FORWARD LINKAGES

Fig. 1.1

sectors by providing sufficient infrastructural base and making facilities (Fig. 1.1).

India, one of the leading third world country, has more responsibilities of finding the way of economic advancement and industrialisation practice of cultivation. Since Indus valley civilization practice of cultivation has made the agriculture as a major way of life to Indians. During ninty years of the present century, the level of urban population has increased from 10 percent to 24 percent (1981) of which 4 percent rise has been only recently (1971-81). Like the Europe of 1800 A.D., India was predominently an agrarian society, which is evident by about 10 percent level of urbanisation.[2] Though modern age ushered in India in the later half of the 19th century when the first railway line, telegraph and early factories were established, the progress of modernisation remained extremely slow. Though still today, 67 percent population belongs directly to agricultural economy. India has made noticeable start of industrialisation during eighties decade - of the present century. The progress of industrialisation has been irregular in time, space and internal structure[3].Though still today only 3 percent of India's workforce is engaged in modern industry, remaining 4 percent belongs to the cottage sector, she is the 10th largest industrialized

2. East,W.Gordan,(1962):*An Historical Geography of Europe*, London,p.392.

3. Spate,O.H.K.et al., (1967): *'India and Pakistan*,London, p.305.

country of the world and significantly spatial impact of industrialization is easily observable on India's land in the form of major industrial regions, industrial tracts, corridors and centres.

A casual observation in an agricultural areas also makes its amply clear that industries tend to concertrate near medium and large towns. A journey from Dehi to Ambala through Gaziabad, Meerut, Muzaffarnagar and Saharanpur, for example, makes it clear that this is developing into an industrial corridor. Such unprecedental industrialization is mainly the result of industrialization of 1970's. However, as would be expected, industries conce trate in a few tracts of land and industrialization has significant spatial dimension.

Muzaffarnagar District of Uttar Pradesh.has been an emblem of agriculturaly developed region, since long time. It has a varity of rich infrastructural facilities, obviously, requisite for agricultural development. The increasing pressure of population has threatened the agricultural development and socio-economic set-up of the area in various ways. The city of Muzaffarnagar and other towns surrounded by a varied range of settlements are rapidly spreading over this rich agricultural topography which has resulted reduction in the best agricultural land, on the one hand and production on the other. Moreover, the fast increasing population in rural and urban areas,

deteriorates the total environmental conditions are affected the agro-economic conditions. It has been evidently marked that agricultural production is not keeping pace with the fast growing population. An interesting fact is that, besides, the high demand of agricultural produces, the area has gigantic surpluses which are being sent outside the area's of production without being properly utilized. Therefore, the primary producer/farmer does reap the actual fruits or benefits of their producer. On account of low storing capacity the farmers have to sell their produces in the harvesting season. Therefore, due to the bulk supply in the peak - period market, rate goes down which ultimately narrows the chances of attaining actual profit of their products. This mechanism leads deterioration of socio-economic environment of farming community. Moreover, the area is dominated by rural society engaged either directly or indirectly in agricultural occupations. So, it is the contention that the son of the soil are not getting desirable fruits of agricultural development. Hence, the question arises as to what should be the mode of agricultural development - so that the interests of primary producer could get momentum in particular and over all society in general ? with the development of agricultural sector and incentives provided by the Government of India, rural and agro-based industries are taking place in the area. But these industrial units could not be desirably helpful in prospering the rural economy. Therefore, the

problem arises that why does not the industries development could promotes the agricultural economy and what are the bottle -necks creating hindrances in agro-industrial progress.

The evaluation of indispensable determining factors of area-specific industrialization is one of the crucial problem of the present study. Spatial patterns of industrialization is significant mainly due to two reasons. The first reason is that such study should lead to the indentification of factors governing spatial industrial patterns. These factors, in turn, would be essentially required for industrial planning. The second reason of such study from the geographic point of view is that sporadic and unplanned spatial development of industrialization could not allowed in those areas where land is important resources: That is why the study of analysis the patterrn of agro-industrialization has its deep rooted links with the landuse of any area.

The following points of the statement of the problem emerges from the above discussion:

1. The present research problem is about identifying regional patterns of agro-industries.
2. The relevance of the problem is that such industrialization shall require spatial planning.
3. Massive agro-industrialization may encroach good agricultural land.

Keeping in vieew the above mentioned issues in the present dissertation, it has been argued that why the district of Muzaffarnagar occupies a prominent place in agro-based industries.

PURPOSE OF THE STUDY:

When one pases through the areas, either from North to South or East to West, experiances about the richness of agriculture in terms of wide ranging vovid agricultural land scape. The agricultural fields present scenerio of developed cultivation practice and simultaniously witnesses the agriculture adjusted with space economy. Despite the high demand of agricultural produces by the population, engaged directly or indirectly in agriculture practice, lives in rural areas as well as resides in urban areas, several agricultural products are available in surplus form. The increasing awareness among the farming community towards the adoption of newly invented technique of the agriculture has brought about significant changes in agro-sector. The farmer, now, wants to produce those crops which are more profitable and fetch more income to them. Presently sugarcane is the chief crop being grown over larger space in the area and it has become an important cash crop as well as industrial crop in the area. During the last two decades, several industrial establishment have taken place in the area, besides the progress in agricultural sector particularly in terms of increased

croping intensity and production. The radical changes and progress in agriculture not merely helped to meet the growing demand of the people, but provides base for agro-pocessing. Therrefore, it is right time to assess the trend of agricultural development in the area. Hence the study has been aimed to evaluate the present patterns, trend and direction of development especially the pattern of agro-industrialization in the area in order to explore the potentiality of agro-industrial development which, by and large, would determine the development of this agricultural region.

The ultimate purpose of the study, however, is contributing to wards the knowledge so urgently required today for industrial planning in India. Geographic study, of industrialization being concerned mainly with the spatial aspects, is the long descipline, expected to contribute in this aspect. Its background knowledge is useful not only to promote industrialization but to preserve resources of the country too. The factors and forces working behind the patterns identified may have something in common in similar areas and in that case very useful for planning purposes. Similarly the process of spatial industrialization, if known, may be utilised in various ways and for planning as solving as solving varied problems related to industrialization as for example, problems of population and health hazards associated with industry especially, running

with less sophisticated technology causing more pollution and environmental degradation.

The study is of great relevance in today,s India which appears at the threshold of getting industrialised and urbanised for the next century. Not only the people but the Government and even international interest has the urge to industrialize developing countries like India. All the aspect of on going industrialization should be exposed to the fullest possible extent, so that planned industrialization could be visualized and practised.

However, agro-industrialization is deemed to be an effective instrument for rural development. These agro-industries are not merely the rural-industries but have been proved facts of rural life. Keeping in view the role of agro-industries in development process, a modest attempt has been made to high-light the regional patterns of agro-industrialization taking Muzaffarnagar District of Western U.P. , as a case study. Moreover, the study has been aimed to discuss the following objectives:-

(i) The patternes of agricultural resources contains sub-topics as agricultural infrastructure, patterns of agricultural out-put and patterns of agricultural surpluses.

(ii) To highlight the patterns of industrial infrastructure especially market, capital, transport and communification, and power.

(iii) To evaluate the existing structure of agro-industrialization in the area so that a comprehensive development plan could suggested for the around development of the area.

(iv) As the persent day spatial industrialization is only the beginning of widespread future industrialization, the study identifies the nucleus of future industrial areas and regions.

(v) Industrialization as expressed on surface has strong spatial reasons. These factors are aimed at being known some that they may be used in planning spatial industrialization. For such planning these factors make essential base.

(vi) The study also tries indirectly to find the reasons of implacement industrial development by finding forces that lead to greater industrialization around cities and lesser in open countryside.

(vii) Sprawl of cities coupled with that of factories is causing various problems for being unguided. His uncontrolled spread of industrialization in areas around cities is sought to be known.

GEOGRAPHIC INTRODUCTION OF THE STUDY AREA:

Western Uttar Pradesh is the most developed and prosperous region of the state of Uttar Pradesh. It occupies the fertile noth-westerrn portion of the Upper Ganga Plan which is well endowed with water resources and good climatic conditions which have favoured agricultural development. It

is also the most developed agricultural region of the state (Sigh, 1988)[4]. It is bounded by the districts of Kanpur, Hardoi and Lakhimpur Kheri of the central region of Uttar Pradesh on the east, by the districts of Pilibhit, Baareilly, Rampur, Bijnore and Saharanpur of the western region of Uttar Pradesh on the north, by the states of Haryana, Rajasthan and union teritory of Delhi on the west, and by the states of Rajasthan, Madhya Pradesh and the district of Jalaun of Bundelkhand region of Uttar Pradesh on the south.

The subdivision of the great Ganga Plain of Northern India is extremely difficult. Physiography is of no help, since there are no marked physical breaks other than river courses and the surface variations that do exist are only local. On the basis of climatic variations the Ganga Plain was subdivided into three, the Upper Ganga Plain, the Middle Ganga Plain and the Lower Ganga Plain. 'The Upper Ganga Plain comprises of that portion of Gangetic Plain which has an annual rainfall of less than 101.60 cm, corresponding to the western two-third of Uttar Pradesh' (Stamp, 1958)[5]. Western Uttar Pradesh is a part of the Upper Ganga Plain.

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4. Singh, A.L.,S.F. Azam & S.N. Hashmi, (1988): *Inter District Variations in the Development of Irrigation in Western Uttar Pradesh.* National Geographer, Vol. XXIII, N.1, p.45.

5. Stamp, L.D.,(1958): *Asia a Regional and Economic Geography;* London.

From Delhi, on the north-west which has a rainfall of 64 cm, there is a gradual increase in precipitation as one goes towards the east down the Ganga Plain. The 101.60 cm rainfall line passes through Allahabad and may be taken as the rough limit of the Upper Ganga Plain. The climate is thus damper and at the same time less extreme than in the Punjab. The region lies between the sub-Himalayan strip in the north and the slope of the central Indian foreland, which begins just to the south of the Yamuna river, in the south, Delhi is only 220 meters above level and hill less plain slopes unperceptibly towards the east (Allahabad). Obliquely across it from north-west to south east flows the Ganga, near the western and southern boundary is the Yamuna. Nearly half of the region lies therefore, in the *doab* between the Ganga and Yamuna.

Uttar Pradesh can be divided into the following seven natural divisions :

(1) Himalayan,

(2) Sub-Himalayan west,

(3) Sub-Himalayan east,

(4) West Plain,

(5) Central Plain,

(6) East Plain,

(7) Southern Hill and Plateau.

The sub-Himalayan west comprises of the districts of Saharanpur, Bijnore, Rampur, Barelly, Pilibhit, Lakhimpur Kheri and Nainital. The west plain comprises of the

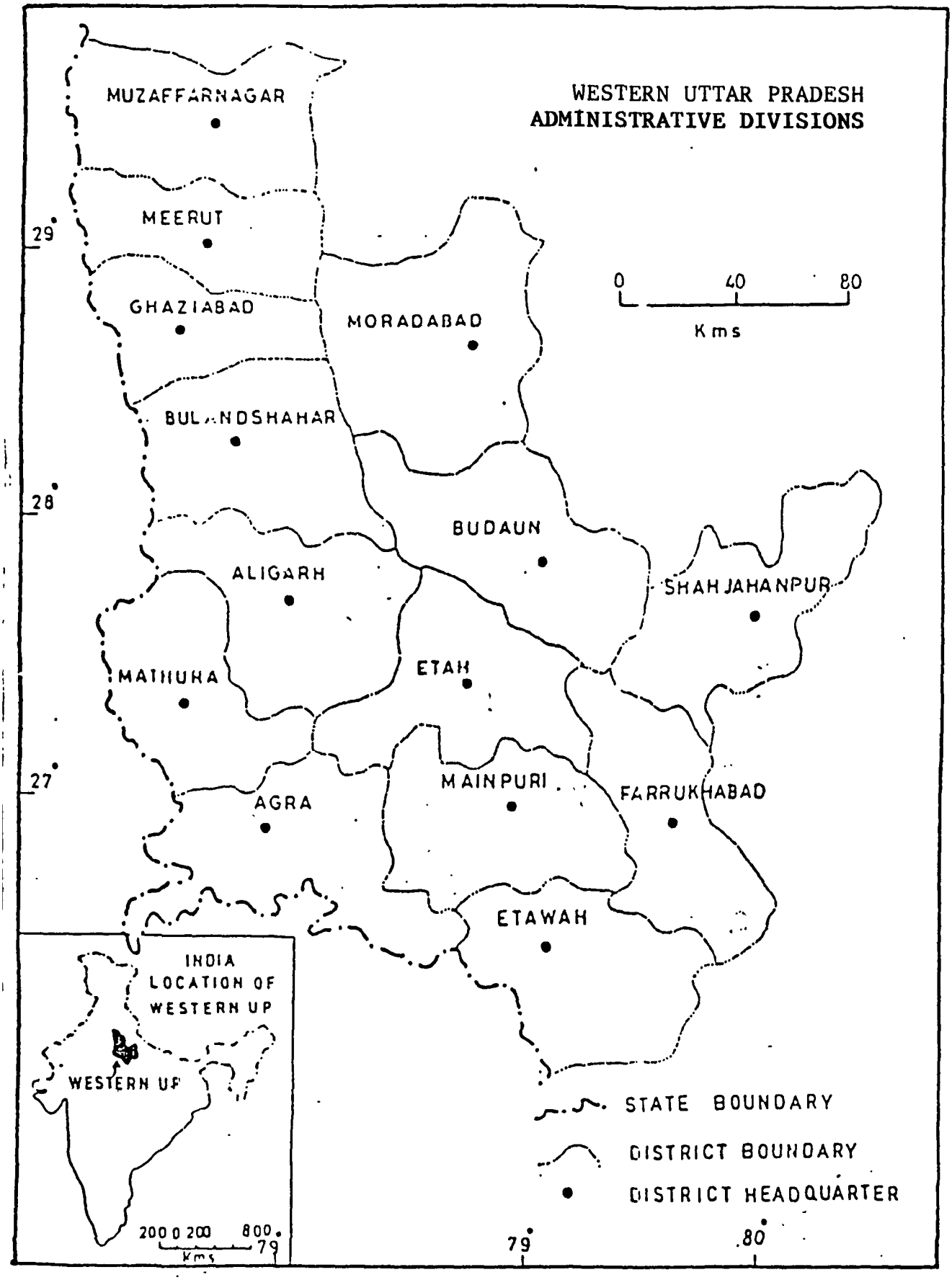
WESTERN UTTAR PRADESH
ADMINISTRATIVE DIVISIONS
MUZAFFARNAGAR
MEERUT
GHAZIABAD
MORADABAD
BULANDSHAHAR
BUDAUN
ALIGARH
SHAHJAHANPUR
MATHURA
ETAH
MAINPURI
FARRUKHABAD
AGRA
ETAWAH
0 40 80
Kms
29
28
27
79
80
INDIA
LOCATION OF
WESTERN UP
WESTERN UP
200 0 200 800
Kms
STATE BOUNDARY
DISTRICT BOUNDARY
DISTRICT HEADQUARTER

FIG. 1.2

districts of Moradabad, Badaun, Shahjahapur, Muzaffarnagar, Meerut, Bulandshahr, Aligarh, Mathura, Agra, Etah, Mainpuri, Farrukhabad and Etavah. The author has taken these thirteen districts of the west plains of Uttar Pradesh as his study area (Census of India, 1961).

Western Uttar Pradesh lies approximately between 26°20'N to 29°45'N latitudes and 77°E to 80°E longitudes. It comprises of fourteen districts of Muzaffarnagar, Meerut, Bulandshahr, Ghaziabad, Aligarh, Mathura, Agra, Etah, Mainpuri, Muradabad Badaun, Shahjahnpur, Farrukhabad and Etawah (Fig 1.2 and Table 1.1). The district of Ghazibad was formed in the year 1976. The districts of Muaffarnagar, Meerut, Ghaziabad and Bulandshahr occupies the Upper Ganga Yamuna *doab*, the districts of Aligarh, Mathura, Agra, Etah, Mainpuri, Etawah and Farrukhabad occupies the Central Ganga Yamuna *doab* while the district of Muradabad, Badaun, Shahjhanpur, lies out side the *doab* in the RohilKhand plains, Western Uttar Pradesh covers an area of 61,763 sq km.and a population of 30,277,145 million.

Geographical factors such as geological structure, relief, slope of the land, quality of soils and the climitic conditions exert influence and control over the techniques of irrigation and area irrigated. The entire distributional system of irrigatation water flows the terrain and the slope of the land. The amount and duration of variable surface

TABLE 1.1: LAND USE PATTERN IN WESTERN UTTAR PRADESH : (in hectares)

	Muzzafar nagar	Meerut	Ghazia bad	Buland shahr	Aligarh	Mathura	Agra	Mainpuri	Etah	Badaun	Shahja hanpur	Murada bad	Farruk habad	Etawan	Western U.P.	Uttar pradesh
Estimate area for Landuse	417.212	391.714	258.675	437.383	502.484	377.200	476.787	432.868	443.622	521.408	456.833	593.719	427.968	436.417	6.174.290	29.747.789
Forest	7.276 (1.47)	7.993 (2.04)	2.555 (0.98)	8.862 (2.02)	808 (0.16)	1.575 (0.41)	39.616 (8.30)	6.971 (1.62)	1.247 (0.28)	6.903 (1.32)	11.179 (2.44)	111.921 (18.85)	3.270 (0.76)	38.683 (8.85)	246.859 (4.03)	5.120.315 (17.21)
User and Uncultu- ral Land	11.342 (2.71)	6.750 (1.72)	10.116 (3.91)	16.057 (3.67)	33.694 (6.70)	6.352 (0.16)	12.667 (2.69)	41.359 (9.55)	14.626 (3.29)	15.973 (3.06)	10.079 (2.20)	14.723 (2.47)	22.415 (5.23)	27.410 (6.28)	243.763 (3.94)	1.120.399 (3.76)
Area and non Agri- culture use	46.213 (11.07)	45.882 (11.71)	34.666 (13.40)	36.769 (8.40)	39.185 (7.79)	29.678 (7.86)	37.934 (7.92)	28.775 (6.64)	39.193 (8.83)	41.411 (7.94)	37.005 (8.10)	47.335 (7.97)	41.044 (9.59)	31.455 (9.49)	536.417 (8.68)	2.336.124 (7.85)
Culturab le Waste	4.30 (1.13)	4.140 (1.05)	7.155 (2.76)	10.693 (2.44)	8.271 (1.84)	6.491 (1.72)	7.019 (1.47)	14.020 (3.23)	35.561 (8.01)	8.381 (1.60)	8.324 (1.82)	11.529 (1.94)	21.876 (5.11)	9.852 (2.25)	159.041 (2.57)	1.146.792 (3.85)
Permanent Pasture	.802 (0.19)	.535 (0.13)	.503 (0.19)	1.717 (0.39)	2.869 (0.57)	1.729 (0.45)	1.464 (0.30)	2.952 (0.68)	1.169 (0.26)	.703 (0.13)	1.280 (0.28)	1.086 (0.18)	3.192 (0.74)	2.298 (0.52)	22.299 (0.36)	298.585 (0.99)
Area under Miscellaneous use	1.582 (0.37)	.332 (0.08)	.810 (0.31)	2.647 (0.60)	1.169 (0.23)	1.425 (0.37)	1.691 (0.34)	2.566 (0.59)	2.983 (0.67)	8.860 (1.69)	6.241 (1.36)	2.475 (0.41)	11.394 (2.66)	1.383 (0.31)	45.506 (0.73)	566.241 (1.91)
Current Fallow	10.281 (4.86)	6.991 (1.78)	7.879 (3.04)	11.037 (2.52)	14.066 (2.79)	11.558 (3.06)	17.952 (3.74)	25.656 (6.15)	26.897 (6.06)	25.547 (4.89)	26.392 (5.77)	14.703 (2.47)	25.057 (5.85)	19.508 (4.47)	243.424 (3.94)	1.175.412 (3.95)
Other Fallow	3.986 (0.95)	5.491 (1.40)	7.130 (2.75)	8.377 (1.91)	11.027 (2.19)	9.898 (2.62)	14.031 (2.94)	25.262 (5.84)	22.578 (5.08)	11.005 (2.11)	10.342 (2.26)	6.107 (1.02)	20.629 (4.82)	17.134 (3.92)	173.018 (2.80)	755.253 (2.54)
Net Sown area	331.000 (79.33)	313.600 (80.05)	177.861 (68.75)	341.229 (78.01)	390.394 (77.69)	308.494 (81.80)	344.498 (72.25)	295.237 (68.30)	299.368 (67.48)	402.625 (77.21)	345.990 (75.73)	483.840 (81.49)	279.089 (65.21)	288.693 (66.15)	4.591.968 (74.37)	17.225.662 (57.90)
Area Sown more than once	182.188 (43.66)	188.064 (48.01)	122.598 (47.39)	244.510 (55.90)	255.234 (50.79)	126.565 (33.55)	126.256 (26.48)	142.550 (32.47)	175.916 (39.65)	154.765 (30.44)	145.401 (31.82)	228.245 (38.44)	125.478 (29.31)	119.772 (27.44)	2.349.552 (38.05)	7.481.951 (25.15)
Total croped area	513.188 (123.00)	501.664 (128.06)	310.459 (120.01)	585.739 (133.91)	635.628 (126.49)	435.059 (115.33)	470.752 (98.73)	437.787 (99.37)	475.284 (107.13)	561.390 (107.66)	491.391 (107.58)	712.085 (119.93)	404.567 (94.53)	408.465 (93.59)	6.931.520 (112.26)	24.707.613 (83.05)
Net irrigated area	288.627 (69.17)	292.779 (74.74)	173.037 (66.89)	327.554 (74.88)	362.512 (72.14)	258.991 (68.62)	220.197 (46.19)	227.874 (52.64)	239.467 (53.97)	238.322 (45.70)	277.717 (60.84)	373.791 (62.96)	188.823 (44.12)	197.108 (45.17)	3.620.889 (58.64)	9.884.295 (33.22)
Total irrigated area	414.370 (99.31)	453.163 (115.68)	271.262 (104.86)	493.001 (112.71)	467.201 (92.97)	297.471 (78.21)	236.152 (49.52)	256.303 (59.18)	299.164 (67.43)	255.165 (48.93)	290.381 (63.58)	456.125 (75.82)	217.715 (50.87)	253.118 (57.99)	4.660.591 (75.80)	12.125.066 (40.75)

Note:-1. Figures in bracket from item No. 2 to 14 shows percentage to the estimated area of land use.

Source:- Statistical Bulletin of Uttar Pradesh (1985-86). Published from directorate of agriculture. Krishi Bhavan, Lucknow.

water depends on climatic conditions or the region. Types of rocks over which the irrigation water flows mostly determine its quality. The physical and chemical characteristics of soils directly or indirectly governs the practices as well as the number of application or irrigation. In this context, therefore, it is relevent to present a brief account of the physical environment of the body area.

Structure and Relief:

Structurally this region is a part of the Indo-Gangetic plain which lies between the Peninsular India in the south and recently built Himalayan mountains on the north. This is one of the most important plains in the worlds. There are several outstanding features of this amazing area. One is the dead flatness of the plain-not a hill, scarcely a mound to break the monotony of the level surface. A perusal of (Fig 1.3) shows that whole or Western Uttar Pradesh is that and the slope and is less than 10 meters per km. So gently is the seaward slope that it is inperceptible to the eye. This region lies at an elevation of 150-300 meters above the mean sea level. Another feature is the sudden rise of the Himalayas from the level plain. These mountains greatly influenced the hydrology of the rivers which flow from them towards this plain. The region , therefore, is made of alluvium brought by the Himalayan rivers, the Ganga, the Yamuna and the Ramaganga. The level

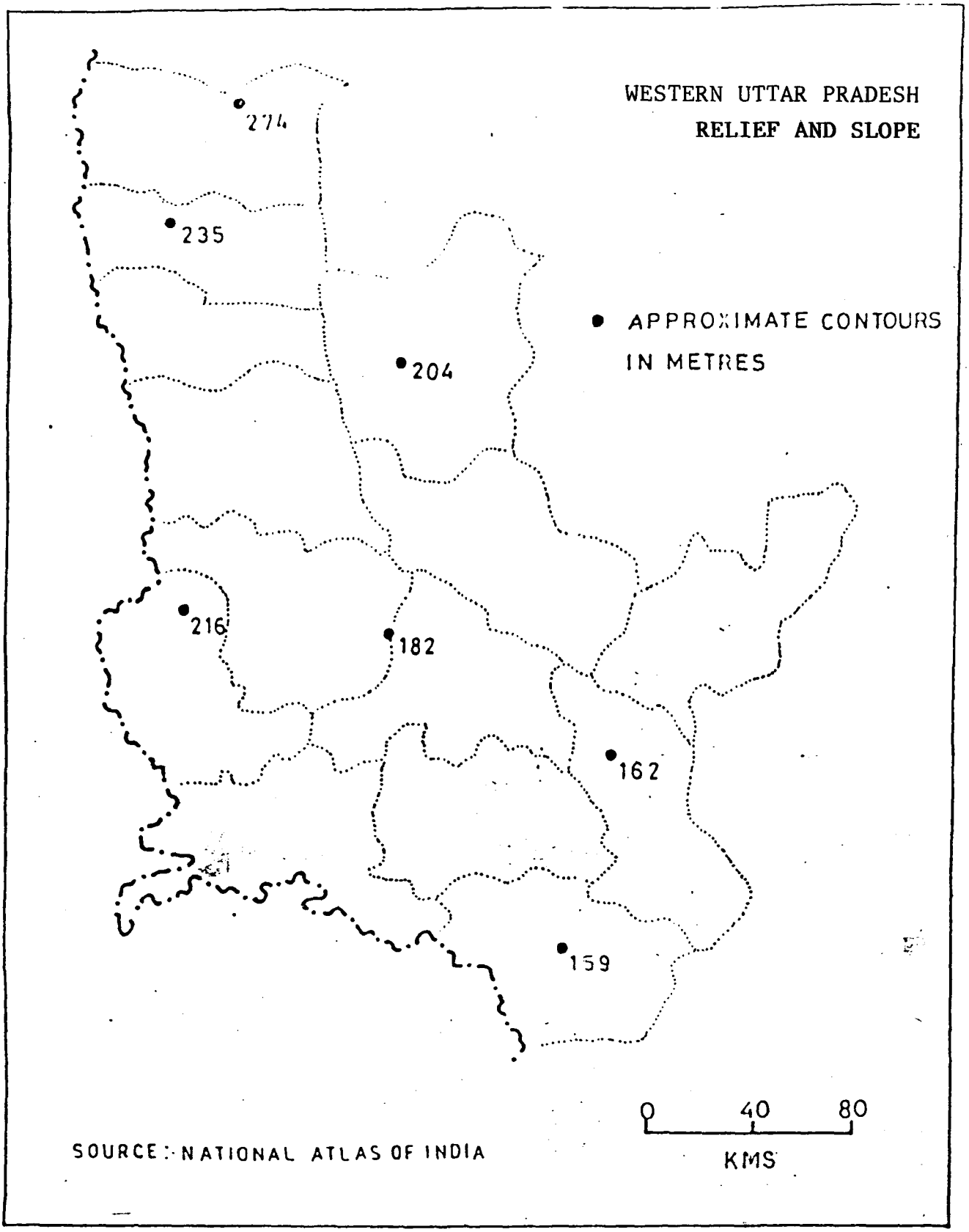
WESTERN UTTAR PRADESH
RELIEF AND SLOPE
274
235
204
216
182
162
159
APPROXIMATE CONTOURS
IN METRES
0
40
80
KMS
SOURCE:- NATIONAL ATLAS OF INDIA

FIG. 1.3

fed perennial rivers of Himalaya offers every facility for the construction of great canals. The absence of the marked surface irregularity further permit the rains to sink into ground, while percolation from major rivers and their tributaries also contribute to maintain the subsoil watertable at level which can be easily tapped (Williamson, 1925)[6]. The third feature of note is the immense thickness, enormous width and uniform character of the alluvium which forms the subsoil of the plain.

There are several theories regarding the origion of the Indo-Gangatic palin. The alluvial tract is of the nature of a synclinal basis formed concomitantly with elevation of the Himalaya to its north. This depression was rapidly being filled up by the waste of the high lands. According to Edward Suess, it was a 'foredeep' formed infront of the resistant mass of the peninsula when the Tethyan sediments were thrust southward and compressed against them. The peninsula is regrated as a stable mass and central Asia as the moving segment of the crust. According to second view, given by Sir Sydney Burrad the plains represent a rift valley bounded by parallel faults on either side. A third and more recent view, regards this region-as a sag in the crust formed between the north west drifting Indian continent and comparatively soft sediments

6. Williamson, A.V.,(1925):*Irrigation in the Indo-Gangetic Plain'*. The Geographical Journal,Vole. VIV, No2, p.145.

accumulated in the Tethyan basins when the latter were crumpled up and lifted up into a mountain system (Krishnan. 1982)[7].

Ageneral acepted view about the origion of the Ganga plain is that, it has been formed by the buckling down of the nothern border of the peninsular shield between the sediments thrust over it from the north. Whatever may be the cause which gave birth to this trough, but once it was formed the depression was filled up with sediments brought by rivers flowing from the Himalayas and the peninsula (Sharma and Coutinho, 1983)[8]. About the period of its orgin it is said that the Indo-Gangetic depression must have been formed in the later stages of Himalayan orogeny when the Indian shield under thrust the Asian continents (Krishnan, 1982)[9].

The exact thickness of the alluvium has not been ascertained, but recent gravity, magnetic and seismic explorations show that it is variable from less than 1,000 to over 2,000 meters (Wadia, 1981)[10]. Geologists differ in their estimates about the thickness of the alluvial deposit.

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7. Krishnan, M.S.,(1982): *Geology of India,* New Delhi.

8. Sharma, T.C., & O.Coutinho,(1983): *Growth of Irrigation and its Impact on Crop Land Use and Yield in Karnataka, 1960-1961 to 1976-1977,* Annals of the National Association of Geographers India, Vol. II, No.2.

9. Krishnan, M.S., OP.Cit,

10. Wadia, D.N., (1981).*Geology of India,* New Delhi.

On the basis of geodetic observations, Glennic estimated its thickness to be about 1,950 meters (Glennic, 1932)[11]. Borings done mainly for artesian wells have penetrated only upto 1,606 meters in the recent allvian strata (Krishnan, 1982)[12]. Magnetic surveys reveal local highs and lows, all of which dip steeply to the north. In the 130 borings, the depth from the surface to bedrock was found to range between 400 meters and 100 meters (Wadia, 1981)[13]. Oldhum, on the basis of geological considerations, postulated the depth of the trough to be about 4,600 meters near the northern limit, from which the floor slopes upward to its southern edge where it merges with the Vindhyan uplands of the Deccan (Oldhum, 1917)[14]. Aero-magnetic surveys of the Ganga basin indicates that the basement rocks lie at a depth of about 7,000 meters and the geophysical indications of the basement are at depth of 6,000-7,500 meters below the surface (Krishnan, 1982)[15].

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11. Glemic, E.A., (1932): *Gravity Anamolies in the Structure of Earth Crust,* Memoirs of the Geological Survey of India, Professional paper No.27,Dehradun.

12 Krishnan, M.S.,Op. Cit.

13 Wadia, D.N., Op.Cit.

14. Oldhum, R.D., (1917) : *The Structure of Himalyas and the Gangetic Plain,* memoirs of Geological Survey of India, Calcutta.

15. Krishnan, M.S., O.p.cit.

The pleistocene and recent deposits covering the Indo-Gangetic Basin are upto 1,000 meters thick. The rocks are every where of fluviatile and subaerial formation- massive beds of clay, either sand or calcareous corresponding to silts, mud and sand of the modern rivers. The sands and gravels constitute aquifers. The subsoil of the plain consists usually of alternate layers of sand and clay to an unknown as one or other predominate. In general, it responds alluvium cannot be over estimated. It is known as ***mota*** in the vernacular and does not form one continuous layer but occurs in beds which lie at varying depths, forming island in the sea of sand deposits. The ***mota*** acts as a beam to support the wells.

The alluvium form one continuous series throughout, but it is unsual to distinguish between the ***bhangar*** of older alluvium which contains fossiliferous remains of Pliocene period and occupies higher lands and the ***khadar*** or never alluvium in which occur fossils, chiefly of living species, are confined to the terraces and flood plains of big rivers.

These plains are an immense reservoir of fresh sweet water, stored in the more porous, coarser strata, beneath the level of saturation, which is easily accessible by means of ordinary borings in the forms of wells. The few deep borings that have been made have given proof of the prevalance of artesian conditions in some parts of the

plains and in a few cases artesian borings have been made with successful results. A considerable amount of success has attended tubewell boring experiments in the plains at many places, wells of large calibre and of a depth of 60-120 meters are supplying water for agricultural use in lands unprotected by irrigation. Throughout the Ganga plain the absence of any great irregularity of surface enables the main canal of a system to be brought to the backbone of the *doab* - the inter stream water shed-with a minimum of delay and expense, from whence lateral branches can be run off.

Drainage:

Western Uttar Pradesh has a vast reservior of surface and under ground waters. Being a part allovial plain of Uttar Pradesh it is drained by perennial rivers of the Ganga system, which privides every facility for the development and construction of canals. Apart from surface drainage this plain also has an immense reservoir of fresh sweet water, stored in the more porous, coarser strata, beneath the level of saturation, which is easily accessible by means of ordinary borings (Wadia, 1976)[16].

Surface Drainage :

The basic source of surface water is precipitation in the form of rainfall or snowfall. Run-off from precipitation drains through streams and rivers or collects

16. Wadia,D.N.,Op.cit.

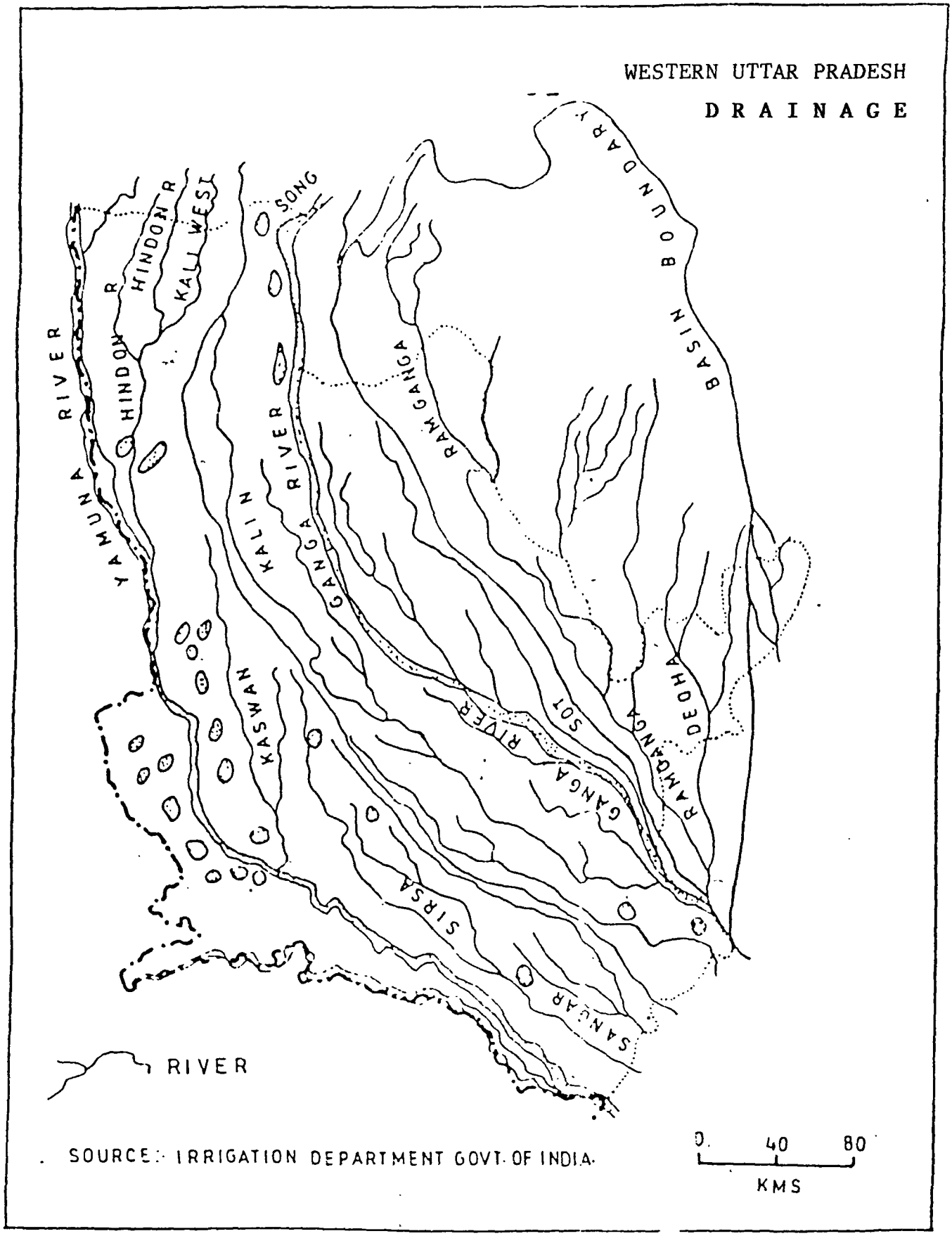
WESTERN UTTAR PRADESH
DRAINAGE
YAMUNA RIVER
HINDON R
HINDON R
KALI WEST
SONG
KALI
KASWAN
RIVER
GANGA
RAM GANGA
BASIN
BOUNDARY
RAMGANGA
GOMTI
RIVER
GANGA
SIRSA
SANGAR
RIVER
SOURCE: IRRIGATION DEPARTMENT GOVT. OF INDIA.
0
40
80
KMS

FIG. 1.4

in surface (Dakshinamurti, 1973)17. Run-off water from streams and rivers is utilized for irrigation purpose by storing in reservoir or directly through canal systems. This region is drained by the Ganga system - the Ganga, the Yamuna, the Ramganga and several tributries (Fig 1.4). These are perennial rivers originating from the Himalayas. They do not depend for their water entirely on the monsoon rains. They are also fed by the melting of the snow of the Himalayans in late winter and summer. Although the volume fluctuates enormously, these rivers are never dry. They yield a supply of fresh water which, though fluctuating, can be guaged and used for irrigation. Further they traverse, as broad slow rivers wandering lazily across the plains, areas of fertile alluvium, very suitable for irrigation. Several system have developed by diverting their water. Thus, the level surface of the plain commanded and traversed by the glacial fed perennial rivers of the Himalaya offers every facility for the construction of great canals and absence of irregularity enables the main canals to be brought to the centre of the *doab*.

The Ganga has a very large basin and it is the most important river of this region. Its source is in the Gangotri glacier. It cuts though the Himalayan range between Banda-punch and Srikanta through a magnificent gorge. The Upper Ganga canal takes is water from the Ganga near

17. Dakshinamurti,C.,(1973):*Water Resources of India and their Utilization in Agriculture'*. I.A.R.I.,New Delhi,p.25.

Haridwar, where the river leaves the mountains, it irrigates a large area of this region. It seperates the districts of Muzaffarnagar and Meerut from Moradabad and Bijnore. The lower Ganga canal takes it water from the Ganga at Narora in the districts of Bulandshahr and it irrigates south eastern districts of the region. The Ganga river forms the eastern boundry of the districts of Muzaffanagar, Meerut, Ghaziabad, Bulandshahr, Aligarh, Etah and Faruukhabad. While for the districts of Muradabad, Badaun and Shahjahanpur it form the western boundry. The general direction of the river is towards south and south-east and it flows through a long course and gathers water from it tributaries - the Yamuna, the Ramganga, the Kali *nadi*, Nim *nadi*, Isan *nadi* Tista, Burdmar, Chhoiya, Bhaisaur and the Sot. Most of these rivers are seasonal and there is an increase in their volume during the rainy season which helps in keeping the level of ground water maintained in this region.

The Yamuna, the western most river of the Ganga system rises on the western slopes of Bandarpuch in the Jmnotri glacier. It is second most impartant river of this region. The Yamuna emerges into the plain from the Mussoorie hills at Tajewala. The Eastern Yamuna canal takes its water from the Yamuna and it irrigates the upper districts of this region. The Yamuna flows in a board curve by Delhi, Mathura and Agra to join the Ganga at Allahabad. The Agra canal takes its water from Yamyna at Okhla near Delhi and it irrigates Mathura and Agra districts. It forms the western

boundry of Muzaffarnagar, Meerut, Ghazaibad, Bulandshahr and Etawah districts. The course of Yumuna is quite irregular but the general direction of its flow is towards the south, south-east. The tributries of the Yamuna are Hindan, Karwan, Rind, Chimbal, Senager, Sirsa and Utangan and most of them are seasonal.

The Ramganga is third important river of this region. It is comparates a small river rising on the southern side of the main range between the ganga and Kali, basin. It drains over a very small part of this region. Area under this river is liable to continuous change owing to shifting of the river. The Sardh canal takes it water from the Ramganga and it irrigates eastern Rohilkhand plain and Oudh. The tributries of the Ramganga are the Kadwara, Bhicha, Ganga, Rapi, Dhela, Khosi, Dhandi, Rajhera, Narha and the Bhagul.

CLIMATE:

India is predominantly the land of tropical monsoon climate. The general climate of the country is warm with ample of sunshine. It is possible to grow two or more crops in a year in most part of the country, provided adquate soil moisture could be maintained. Western Uttar Pradesh lies between the Punjab plains with extreame climatic conditions and plain of Eastern Uttar Pradesh with heavier rainfall. The climate is thus damper and the same time less extreame than in the Punjab and the rainfall is

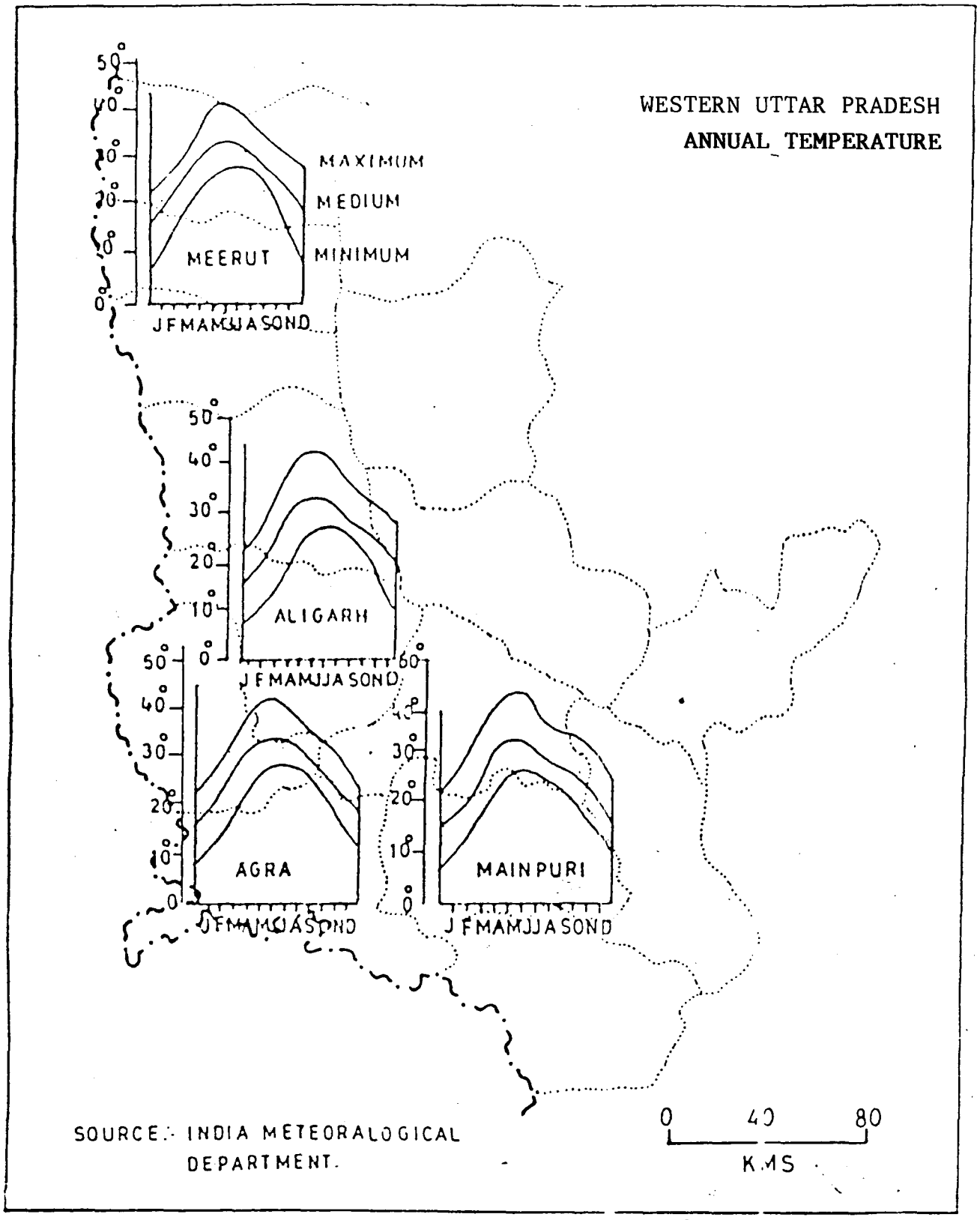
WESTERN UTTAR PRADESH
ANNUAL TEMPERATURE
MAXIMUM
MEDIUM
MINIMUM
MEERUT
ALIGARH
AGRA
MAINPURI
J F M A M J J A S O N D
SOURCE:- INDIA METEORALOGICAL DEPARTMENT.
0 40 80
K.MS

FIG. 1.5

lesser than that of which falls in Eastern Uttar Pradesh. The maximum summer temperature varies between 43°C to 45°C during the summer months of May and June. While minimum temperature during winter ranges between 3°C to 4°C with 4 to 5 centimeters of rainfall. The region receives 60 to 100 centimeters of rainfall and 90 percent of total rainfall occurs during rainy season. Irrigation, therefore, is necessary for the growth of second *Kharif* crop during the summers, for the growing of *rabi* crop during winters and it is desireable even in the rainy season to counter the effect of short dry spell.

From climatological point of view the year of this region has been divided into three seasons. The cold weather season from October to the end of February. The hot weather season from the beginning of March to mid June. The rainy season from mid June to the end of September.

Winter seeason is marked by fall in temperature and prevalance of dry and chilly westerlies, clear skies occasionally the western depression with well come rains, cold waves and registering temperature below freeing point. The maximum temperature falls from about 29°C to 23°C while minimum falls from about 12°C to 10°C in December (Fig. 1.8). The temperature shows a further decreasee in January, when the maximum and minimum are 21°C and 6°C. The cold waves coming from the Himalayas also brings a fall in the temperature for a short period. The direction of prevailing

winds is normally from west and noth-west to east and south east. The winds are dry and light and generally blow at an average speed of about 3.2 kilometers per hour. Frost also occurs during winter season which is harmful for crops like *arhar*, peas and mustard. During the months of January and February a series of western depression enters India through Iran, Afghanistan and Pakistan and moves eastwards across this region. These bring snow to high ranges in Himalayas and rain to sub-mountain tracts and the adjoining areas. Thus, they bring cloudy weather, cold waves accompanied by light rain to plains of Western Utter Pradesh (Gilbert et al., 1910)[18]. The total amount of rainfall during the winter season does not exceed 4 to 5 centimetres. The precipation decreases from west to east. The winter rains though small in absolute amount or great importance to the *rabi* crops of this region. The amount of rainfall is not sufficient for *rabi* crops especially for the high yielding variety of wheat which requires five to six irrigations. Therefore, there is need for greater protection owing to less reliable winter rains. Under these conditions irrigation is a must for carrying sucessful agricultural operations. Proper irrigation also saves the crops from the loss caused by the frost.

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18. Gilbert,J.,Walker,Ray Bahadur and Hem Raj. (1910):*Cold Weather Storms of North India.* memoirs of Indian meteor.Department Vol.XXI,part VII,p.10.

The hot weather season extends over the months of March, April, May and first half of June. This season is characterised by rising temperature and falling pressure. Though the temperature starts rising gradually from February but from early March it starts rising rapidly and continuous rising till the months of May and June. The maximum and minimum temperature for April are 38°C and 21°C. The months of May and June record exceptionally high temperatures, as high as 44°C and even more than 46°C for a few days. The days are characterised by intensive heat, dry air and low relative humidity. Regular phenomena of this season is the flowing of hot and dry winds, locally called as *loo*, and the occurence of dust and thunderstorms which are locally known as *andhis*. They usually occur in the after noons and are accompanied by squally winds, thunder, blinding dust and some times rains. Thus, the high temperature of summers are often accompanied by strong winds and low relatives humidity, a condition which causes rapid evaporation of soil moisture, second crop therefore, is not possible without irrigation in this region.

On account of the excessive heat of the summer months, a low pressure is developed in nothern part of India and by the middle of June it brings a complete reversal in the air movements. The rainy season normally commences in second week of June. This is the season of general rains which is characterised by the arrival of humid oceanic currents, fall in temperatures, cool air and rainfall. Thus,

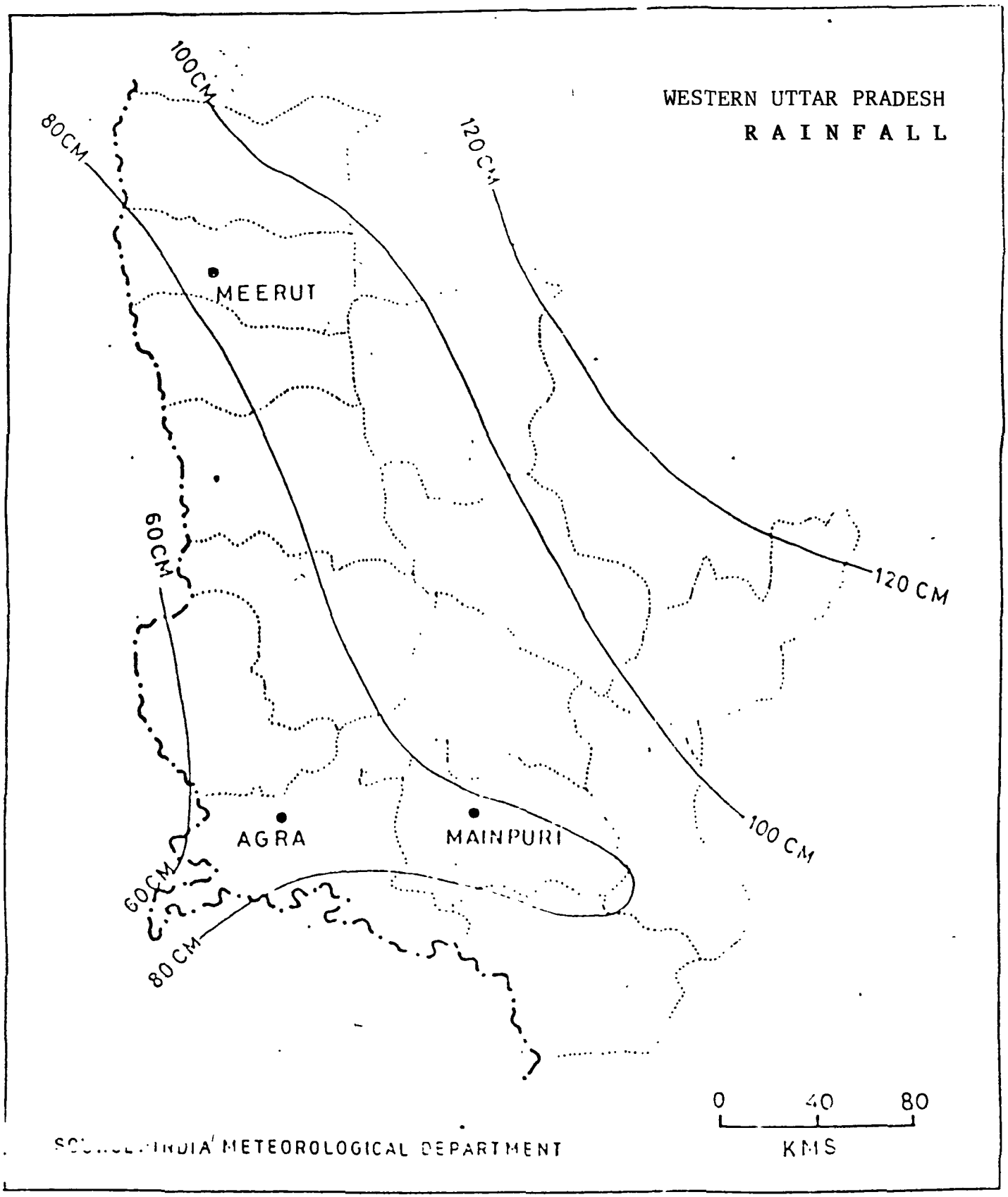
WESTERN UTTAR PRADESH
RAINFALL
100CM
80CM
120 CM
MEERUT
60CM
120 CM
AGRA
MAINPURI
100 CM
60CM
80 CM
0
40
80
KMS
INDIA METEOROLOGICAL DEPARTMENT

FIG. 1.6

the approaching monsoon brings a great change in the weather condition of this region. The maximum and minimum temperature gradually falls from 44°C & 27°C in June to about 30°C and 25°C in July. The relative humidity remains over 70 per cent throughout the rainy season. The average rainfall is about 75 centimeters and the amount decreases west wards as well as south wards (Fi 1.6). Agricultural activities are much dependent upon the onset, withdrawl, breaks and nature of downpour. Though the amount of rain fall received by the region during rainy season is sufficient for crop production but due to its unfavourable time as it does not occur during growing time and uneven distribution, major part of rain fall occurs during the month of July and Agust, for higher yields the farmers have to depend on irrigation. Indian agriculture is a gamble with monsoons. Rain governs life to degree not easily realised in land with a more evenly distributed precipation. The major part of the rainfall is concentrated during the three to four monsoon months and the intensity of rainfall also varies. Agriculture in areas with 100 centimeters of rainfall is particularlly entirely dependent on irrigation. While areas receiving 100 centimetre or more of rainfall per year, it is possible to raise one crop during the monssons. The monsson of *kharif* crop also suffers from dought or flooding due to erratic and unreliable nature of rainfall. The *kharif* crop, therefore, generally requires supplemental irrigation. Thus, the crucial months for the agriculture are

July and August and the fate of rainfed *kharif* crop largely depends upon the amount and distribution of rain especially during these two months. The existance of such climitic conditions has, since ancient times, necessitated the use and development of irrigation for higher crop production.

SOILS:

The soil of western Uttar Pradesh are of alluvial origin. These soils have resulted from the deposition of the silt brought by the rivers and tributries of the Ganga system. They cover an area of 450,000 kilometers in the Indo-Gangetic plains. The alluvial group has been divided into two broad geological subdivisions, i.e. old and new alluvium. The newer alluvial sandy nature, of less *kankary* composition and light in colour is known as *khadar*. It is in the process of building up. The older alluvium of more clayey composition, full of *kankar* and of dark colour is called *bhangar* . It is in process denudation. The new alluvium occupies the flood plains of the rivers and their tributries as a result of which the constituents of such lands are renewed every year. Whereas, the older alluvium occupies the level plain above the general flood limits of the main rivers and their tributries (I.C.A.R., 1969). The soils differ greatly in texture and consistency, ranging from sands through loams and silts to heavy clays that are illdrained and some times charged with injurious accumulation of salts, producing sterile, deflocculated

conditions called *usar*. The colour of these soils is generally grey, light brown or yellowish.

The subsoil of the plain consist usually of alternate layers of sand and clay to an unknown depth. and the water retaining powers are greater or lesser according as one or other predominates. In general, it responds admirably to irrigation. There are , however, extensive *usar* tracts to be found in this region. The relationship existing between irrigation and *usar* land is of importance. Excessive water or over irrigation may cause excessive seepage therefore, raising of groundwater level and water logging conditions. This result in the spread of alkanity in the canal irrigated tracts. For reclaiming of salt infested lands we need water for flushing and washing away the salt from the surface so that the salts get dissolved with water and percolates downwards. Therefore, however drainage is inadquate or over irrigation is practiced, the good lands become gradually uncultivable lands.

The importance of clay in Gangatic alluvium connot be over estimated. The presence of impervious clayey layer often obstructs drainage and this dose not form one continous layer, but occur in beds which are found at varying depths. This act as a beam to support the well, which is fed with water through holes which are bored through the clay to tap the saturated sand below. Wells constructed on clayey foundations are called 'spring wells' and they may be permanent or temporary.

Generally the soil of this region are so uniform and similar in their characteristics that it is often difficult to differentiate the soils of one region from that of the other. Broadly speaking the soils of Western Uttar Pradesh can be classsified into three groups: (i) The *khadar* or newer alluvium, (ii) The *bhangar* or older alluvium and (iii) The *tarai*.

Attempts have been made by several groups of soil scientist to classify the soil of Western Uttar Pradesh on different criteria. But most of them give only a generalized picture of these soils.

Spate (1954)[19] classified the alluvial soils on the basis of texture into four categories (i) Loam (*dumat*), (ii) sandy (*bhur*), (iii) clay (*matiyar*) and (iv) heavy clay (*usar*). Raychaudhry (1963) classified the soil on the basis of texture, colour, availability of water and level of land into four groups (i) alluvial soils, riverine, recent, (ii) alluvial soils, riverine, old, (iii) alluvial soils riverine affected by salinity and alkanity and (iv) *tarai* soils. Planning Atlas of Uttar Pradesh (1987) on the basis of soil and use land use survey, has divided the soils into three categories (i) *tarai* soils, (ii) alluvial soils and (iii) red soils, (a) red sandy soils and (b) red brown soils.

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19. Spate, O.H,K.,Op.Cit,.

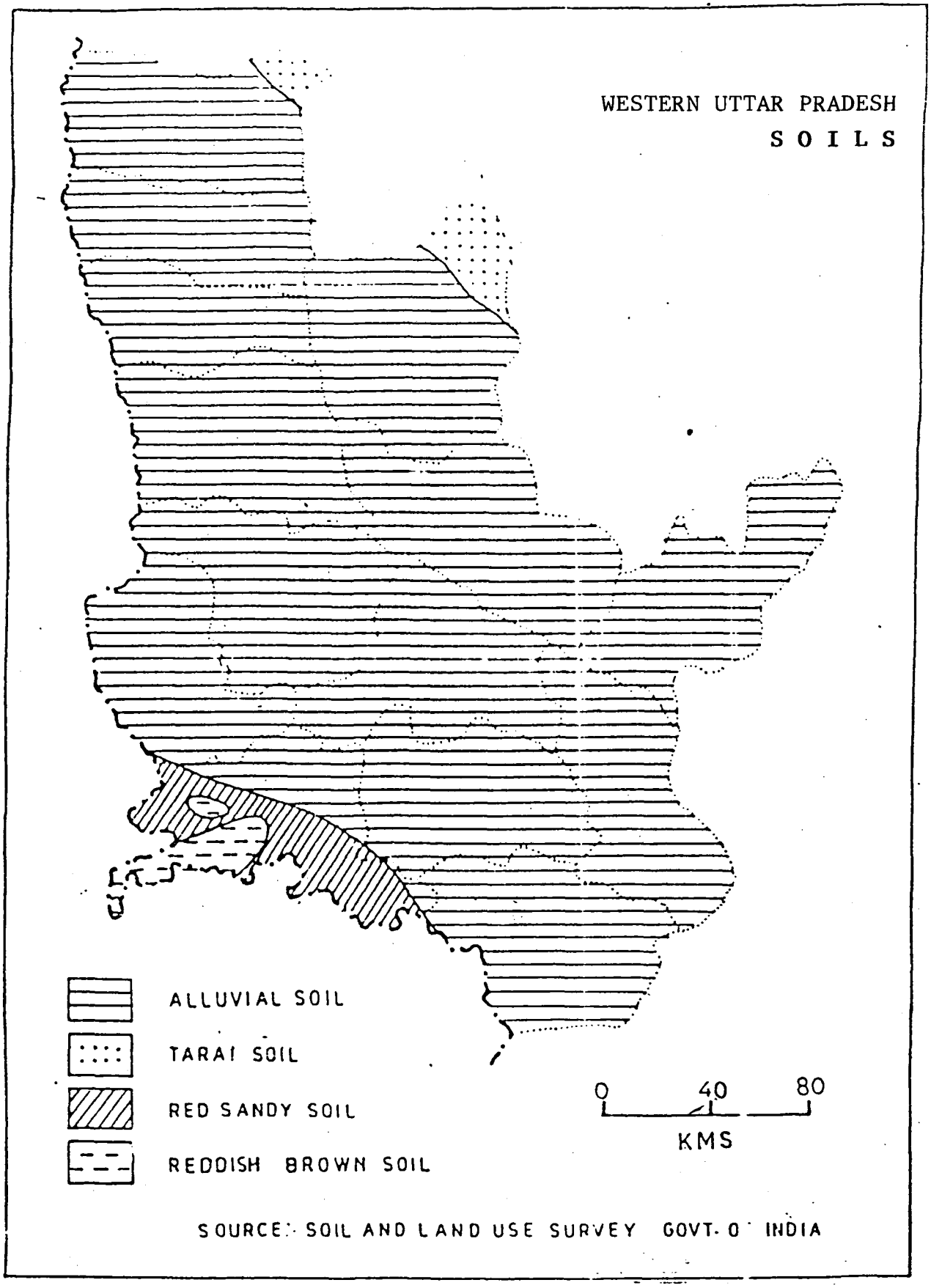
WESTERN UTTAR PRADESH
SOILS
ALLUVIAL SOIL
TARAI SOIL
RED SANDY SOIL
REDDISH BROWN SOIL
0
40
80
KMS
SOURCE: SOIL AND LAND USE SURVEY GOVT. OF INDIA

FIG. 1.7

According to the soil survey, carried out Raychaudhry (1963)[20] four soil have been reconised (Fig. 1.7).

(i) Alluvial soil, riverine, recent or *khadar*:

Khadar also known as newerr alluvium corresponds with the recent geological age of the quarternary era. It is limited in extent and strictly confined to the terraces and the flood plains of the big rivers i.e., the Ganga the Yamuna and the Ramganga and their tributries. It makes strip along both sides of main rivers, therefore, it is always exposed to floods and water logging. Its water retention capacity is very poor, it has less *kankary* composition, it is light in colour and sandy in nature. The ground water table is usually very high and lies near the surface. As already stated the newer alluvium is of sandy nature. Locally known as *bhur* which consists of sand of wheatish colour. The colour of the soil varies from light grey to ash grey and texture is sandy-loam to silty-loam. The *khdar* lands are quite precarious for agriculture it is generally used for the production of millets and pulses in *kharif* and barley and gram in *rabi*. Salt afflorescence is quit negligible in sandy tracts (Agarwal, et al., 1952)[21].

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20. Raychaudhry,S.P. & R.R.Agarwal, (1963):*Soils of India* I.C.A.R., New Delhi,p.35-41.

21. Agrwal, R.R.,et al., (1952):*Soil Survey and Soil Works in U.P.*,National Geographers, Allahabad, Vol. I & II,p.16-19.

(ii) Alluvial soils, riverine, old or *bhangar*:

The area under ***bhangar*** or older deposits is much more extensive than the ***khadar***. The older alluvium occupies the level plains above the general flood limits of the main rivers and their tributries. The most important material in ***bhangar*** is clay which at places becomes or sandy-loam. It generally contains ***khadar*** and is of darker in colour.

On the basis of texture the *bhangra* soils have been further divided and discussed.

Sandy soils (***bhur***) adds variety to the monotonous land scape, its sandy ridges with a flat topped and gentle lateral slopes extended into the districts of Moradabad and Badaun parallel to Ganga from nothwest to southwest. It is poor in humus contents and moisture retention. It was until recently a somewhat negative tract, but now it has been reclaimed through some manuring and irrigation and is being utilised for agriculture (Spate, 1957)[22].

Sandy loam soils occupy cosiderable portions of the generally well drained plains. They stretch in elongated strips along the main rivers and just in the immediate vicinity of the ***khadar*** lands. The greatest width of this tract is seen in Aligarh, Agra and Mathura districts. This tract is rather broad in the upper regions in Muzaffanagar, Meerut, Bulandshahar and in parts of Aligarh districts. It is interspread by long patches of good quality loam chiefly

22. Spate, O.H.K., Op.Cit.

in Etah and Farrukhabad districts. The sandy loam belt in Badaun and Moradabad districts stretches along both eastern and westerrn side of the *bhur* tracts as well as the north and south of it. The outstanding characteristic reature of this soil is its homogenity and level topography throughout the area. The texture is predominantly sandy. its colour ranges from yellow through brown to reddish brown. The moisture retention capacity is generally low. without proper irrigation and manuring this soil is not round fit ror crop production.

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production.

Loamy soil lies disconnected patches. It is the best soil of this region, rich in humus and organic matter, water retention capacity of this soil is comparatively high and the underground water level is low. Locally it is known by the different names as *matiyar, domat* and *kalihar*. One elongated patch passes the though the districts of Mathura and Agra on the western side of Yamuna, another patch passes through the districts of Aligarh, Etah and Farrukhabad running more or less parallel to the *nadi*. The tract covers the districts of Muradabad, Badaun and considerable parts of Shahjahanpur. It is not the best soil of this region. It is mostly rich in humus and organic matter, the colour ranges from light grey to brownish grey. The underground water table is low. The surface soil have more of sands, shows light acidic reactions, while at places where the percentage of clay increases, the reaction is mostly basis and the surface is covered with salt efflorescence. In many depressed area the percentage of clay increases towards the lower depth, with the result that *kankar* pans are round in the bottom (Raychoudhry, et al., 1963).[23]

Clayey loam soils occur in low lying where *jhils* and swamps are common and the drainage is very much

23. Raychaudhry.S.P., (1963):*Indian Soils their Classification, Occurrance & Properties.* Vol. I,Government of India, New Delhi.

restricted. The calcareous pans (*kankar*) are also found sometimes in the sub-soil. It is second important soil of this region.

Clayey loam occur in the low lying area where *jhils* and lakes are common and the drainage is restricted. One tracts of this soil is found between the Rind and Senger *nadi*, another in the north-east and west of Ramganga in Badaun, Shahjahanpur and Moradabad districts. It is also found in the western most part of Mathura and Agra districts. This soil is darker in colour, calcareous pans are also found sometimes in the sub-soil.

Silty-loam soil is slightly diffrent from the loamy soil. It is more fertile due to shift in the upper layers. It is found dispersed in upper interfluvial plain of the Ganga-Ramganga *doab*.

(iii) Alluvial soil affected by salinity and alkalinity:

The saline and alkali soils popularly known as *reh,usar,kallar or thur* are found in vast stretches. It is generally distributed in the lowlying and illdrained areas. More or less it is found in every districts, but in Aligarh, Mainpuri, and Etawah it covers vast areas.

(iv) Tarai soils:

Tarai soils are found in Moradabad districts. The texture varies from clay-loam to sandy-load, due to excellent moisture the need of irrigation is less. The surface soils are rich in organic matter as well as nitrogen

content.

Muzaffarnagar District (U.P.), about 100 kilometers North to Delhi in the Upper Ganga Yamuna interfluve *Doob* is one of 413 (1981) districts of India selected for the intensive study of M.Phil work.

Muzaffarnagar district (extending between 29°11' to 29°43' north latitude and 77°4' to 78°7' east longitude) is located in the central part of the Upper Ganga-Yamuna Doab of western Utter Pradesh. The region illustrates well the characteristics associated with the alluvial monotony of the Upper Ganga plains lying between the Ganga in the east and Yamuna in the west. The districts border Bijnor district in the east, Karnal, district of Haryana state in the west, Saharanpur district in the north and Meerut in the south. It covers an area of 4245 Sq.kms. and is roughly rectangular in shape, with an east-west extension of 84.8 kilometers and north-south extension of 49.6 kilometers.

Physiographically, the whole districts is slopes towards the south direction. The rivers, Ganga, Kali, Hindon and Yamuna played an important role in fashioning the topography of the region and have divided into four tracts. On the extreme east is the ravine tract of the Ganga known as (*khadar tract*). Next comes the tract between the Ganga and western Kali rivers through which runs the upper Ganga canal and generally known as the Ganga canal tract. West of this is the Doab tract of the Kali and the Hindon rivers.

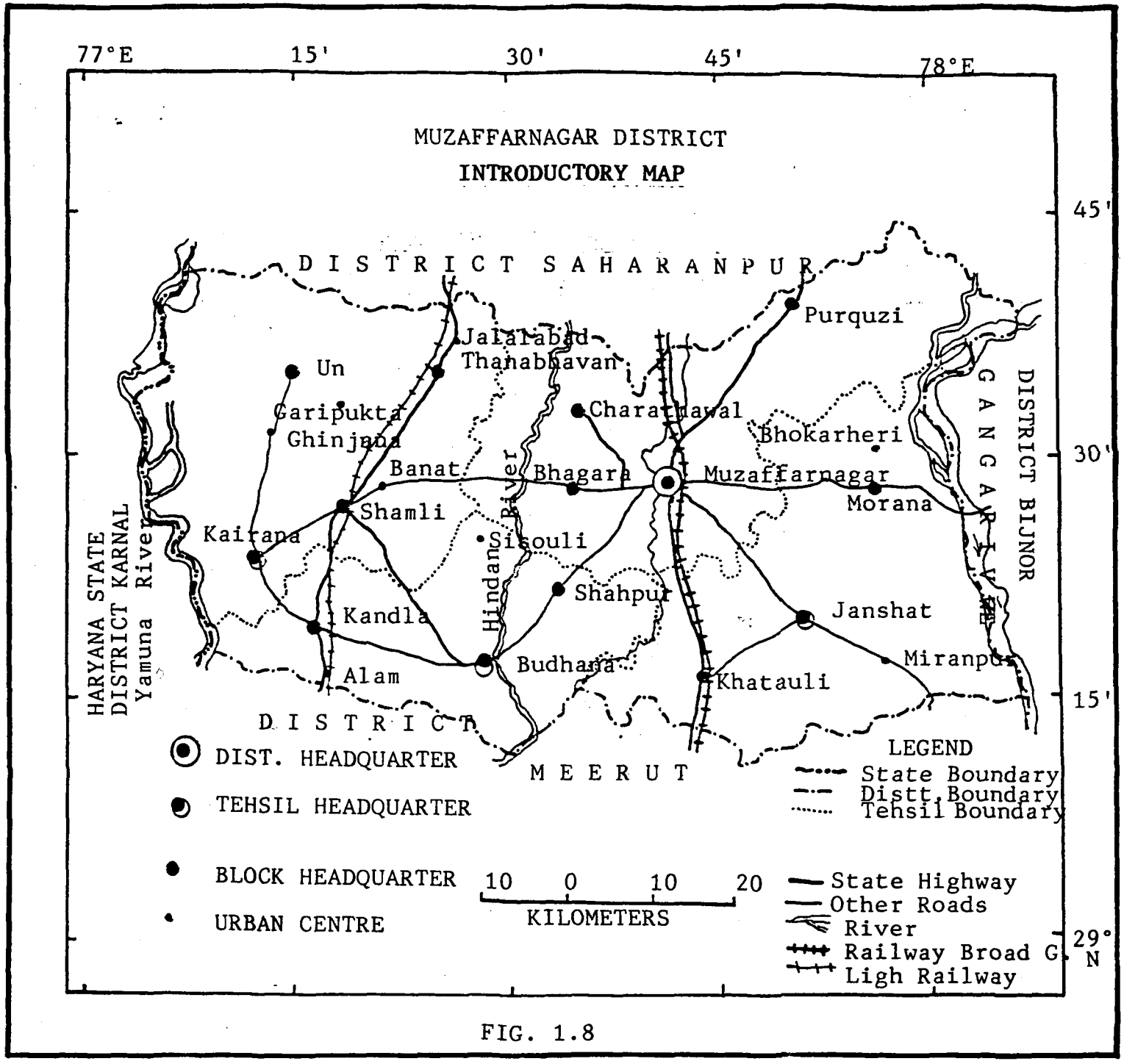
77°E
15'
30'
45'
78°E
MUZAFFARNAGAR DISTRICT
INTRODUCTORY MAP
45'
30'
15'
29° N
DISTRICT SAHARANPUR
DISTRICT BIJNOR
HARYANA STATE
DISTRICT KARNAL
Yamuna River
GANGA CANAL
Hindan River
Purquzi
Jalalabad
Thanabhavan
Un
Charthaval
Garipukta
Ghinjana
Bhokarheri
Banat
Bhagara
Muzaffarnagar
Morana
Shamli
Kairana
Sisouli
Shahpur
Janshat
Kandla
Alam
Budhana
Khatauli
Miranpur
DISTRICT MEERUT
DIST. HEADQUARTER
TEHSIL HEADQUARTER
BLOCK HEADQUARTER
URBAN CENTRE
10 0 10 20
KILOMETERS
LEGEND
State Boundary
Distt. Boundary
Tehsil Boundary
State Highway
Other Roads
River
Railway Broad G.
Ligh Railway

FIG. 1.8

The remaining part of the district comprises with that portion of the districts which extend from the Hindon to Yamuna, generally known as the Hindo-Yamuna tract (Surya Kant, 1980).[24]

According to 1981 census, over 2.2 million person live in 926 inhabited villages spreading in a varied rang around large to small urban centres. For administrative purpose the revenue villages of Muzaffarnagar have been grouped into 14 blocks namely, Purquazi, Morna, Jansath, Khatauli, Muzaffanagar, Charthawal, Baghara, Shahpur, Budhara, Shamli, Thanabhavan, Un, Kairana and Kandhala. And further into four Tahsils-Muzaffanagar, Jansath, Budhara and Kairana. Their are 20 Urban centres of varying (census 1990-91). Out of these urban centres one centre enjoys the facility of beinged districts, tahsil and Block headquarter. Four centres have the advantage of Tahsil and Block level facilities and 7 Urban centres enjoys the facility of block level. The remaining centres are small service centres in which two centres namely Alam and Banat are newly emerged service centres included in 1990-91 census. It is one of the interesting feature is that two block head quarters do not enjoys the status of urban centres while rendring the block level facilities (Fig. 1.8).

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24. Kant, S&Dubey, K.N., (1981): *Spatial Structure of Administrative Units and Development Process* paper persented in III Indian Geography Congress, New Delhi.

The area is densely populated comprising of population (1981) out of which 12 lakh are male population. As the majority of settlement are rural that is why a large number of population that is around 18 lakh lives in rural areas and characterised by rural way of life where as five lakh population unevenly reside in twenty urban centers of varied hierarchy but most of the villages are big rural settlements having an average population around two thousand persons. The schedule caste population constitute about 19.8 percent of the district population and moreover, it is 1.24 percent of the state schedule caste population. Total urban population is about 22.2 percent of the total population (1981). The general density of the population in the area is noted 545 person per/square kilometers. During the last decade and average growth rate of the population have been ranked 26.2 percent is little higher then the state and national figure during same period. As for the size of the family is concern it is more or less came in rural (6.3 persons) and urban (5.9 persons) areas. The average family sizes 6 persons.[25]

Occupational structure of the population of any area is in itself impenetrable to which and obviously reveals the material wellbeing of the population or of the country. And an average of the working total population in

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25. [1] All population figures from Census of India, 1981- Provisional Population Totals, Series - 1 paper 1,2, & 3.

the district is 28.5 percent out of which 29.1 percent is rural and 26.2 percent is urban. It reflects the high dependense ratio which deteriorate the socio-economic environment of the people in the area. The data of occupational structure reveals that 70.8 percent of the total working population is engaged in primary sector (42.1 percent agriculturist, 28.1 percent agro-labour, 0.6 percent animal breeding forestry. Secondary sector engages 11.1 percent of the total working force, it includes domestic industry (4 percent) and other domestic industries (7.1 percent). The remaining population (18.1 percent) is engaged in tertsiory sector, particularly construction (1.7), trade and commerce (6.4) transport and communication (2.2) and other 7.9 percent. The statistic related to working structure of population exibits that the population engaged in primary occupation is of course, little higher than the national average. It however, prove that the area is an ariculture one. Moreover, the area will still remain agricultural in coming minimum first half of the twenty 1st centry if the trend of different activities curban and industrial remains centinue at the present rate.

Economy of the area comprises mainly of agriculture and associated activities. The lopsidedness and little diversification of the economy is prominent feature. Low percentage of urban population and little magnitude and geographic spread of non-agricultural population of the villages reaffirms this. Most of the villages, have 100 to

60 percent of their population in primary economic activities consisting of cultivation and agricultural labour, mining and foresty being almost absent in the district.

Thus the economy is heavily rural and no noticeable economic transformation of villages seems to have occurred. A little transformation that is apparent is perhaps the function of town and road-effect. Around Khatawli, Muzaffarnagar, Budhana and Shamli and along Budhana-Muzaffarnagar-Rohana road, such transformation is most conspicuous.

The area practised well irrigated agriculture producing mainly wheat and sugarcane. Both the crops claim almost equal land with infra-areal spatial variations. Rice in the nothern part and pulses in the north-western are other important crops grown.

The district linked with areas north and south of it mainly by Saharanpur-Meerut section railway and Rurkee-Meerut section of State Highway. This is the main flow-line passing through the district. Another less significant route consists of a railway line and a parallel road linking. Delhi and Saharanpur via Shamli. Other relatively less important roads are laid out in the east-west direction, the most important of which is one running from Muzaffarnagar to Panipat via Shamli and Kairana and yet another to Bijnor.

The most important trade is in Jaggery and low-grade sugar.[26] The former considerable size and sold to the nearby town. Muzaffarnagar is the largest gathering and distributing centre of Jaggery from where it is sold mainly 16 Maharashtra, Gujrat, Rajasthan and West Bengal. There is no running in the area, minerals being absent in production till present. Nodular carbonates of lime (Kankar) are the only materials quarried. Earlier it was much demanded for construction. Soils are used for brick making. However there is need and scope of exploring industrial uses of rocks such as rare earths. Besides, there is need of exploring the possibilities of oil and gas.

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26. Rawat, D.S., (1989): *District Planning for Industrial Development, History and impulses of Industrial Growth*, C. W.P., New Delhi, P.29.

CHAPTER – II
CONCEPTUAL AND METHODOLOGICAL FRAME WORK

THE AGRO - INDUSTRIES :

India has been characterised as an agricultural country mainly because the bulk of its population is rural based, and the most dominant occupation is agriculture thgough, the contribution of agriculture to the G.N.P. is less than half. In a developing country like India it is not possible to made progress by depending on and encouraging agriculture alone, unless a two pronged approach, involving both agriculture and allied industries, is adopted.

Agro-based industries have much to contribute to the economic life of any developing country. They provide a base for a pattern of socio-economic development that can contribute to an overall growth, of the economy. They operate move as catalytic agents for development of agriculture and help in bringing the gap between rural and urban economics.[1]

Today the agro-based industries constitute the backbone of a developing economy. These industries have become an involvable weapon in bringing into existance a normonously balanced integrated socio-economic order in the world economy. The role of agro-based industries in most valuable highly developed economics of the world, both in respect of employment and value added by manufacture, not only in the developing economics of the world but also in the

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1. Puranik V.G.,(1970) : *Agro-Industries and Economic Development: Agro-Industries in the Economy of Uttar Prades*. Edito. Mohommad Mohsin, Faculty of Commerce, Aligarh. p.3.

Economic prosperity of a developing economy like India's is dependent on integration of its agriculture with industry. Rural people from the bulk of the population and their freedom from. constraints arising from economic imbalances would depend upon how best we diversify rural economy. Taking away a few millions of people from village to industrial sites could not remove the fundamental problems of the increasing pressure of population on the agricultural economy. lack of employment opportunities in the rural areas and the resultant limitations on equitable distribution of national income. Therefore. the strategy of economic growth has to be such that it integrates rural and urban economic growth has to be such that it integrates rural and urban economics by eliminating regional imbalances.

The regional imbalance can be achieved only by inducting indutry in the rural areas on a large scale. In this process agro-industrial development would than signify a pattern of deliberate. planned development that occurds with the need of rural areas in different parts of the country. that is. while the basic approach to development and its objective would remain the same for the country as a whole. Where the choice. the range of activities in any given areas. would be determined wholly by the resources of that area in men. their skill. apptitudes and adoptability.on the one hand. and on the other the material. markets and state of other essential infrastructure in relation to felt needs. development would. therefore. be free.

Industrialization feeds upon aricultural surplus. and unless the farmers produce more than their needs, they will have nothing to sell, and, there, nothing to buy. Increasing agricultural production furnishes purchasing power. Industrialization thus can not precede, but has to follow increased agricultural production. If the marketable agricultural surplus is low, industrialisation will not acquire the necessary momentum. Increase in productivity of land is thus an important pre-requisite for diversification of rural economy.

Increase in productivity of land depends upon the technological changes in agriculture. Agro-based industries are considered the most suitable agencies for achieving this. Experience has shown that in rural areas, where agro-based industries have come up in a big way, development is faster. It means development of agro-based industries implies development of agricultue, on the one hand and on the other, of entire groups of industries to cater to mass consumption needs. This is not marely to raise the level of material living but also to promote those basic value of rural sector which make life worth living.

Imperfection in the system of processing-marketing of agricultural produce are significant restraints on agricultural production. There is, therefore, immediate need for developing an efficient and orderly processing - marketing system.

Such a system should has to be such that on the one hand it renders these services efficiently and on the other ensures incentives to the farmers for better and move production. Therefore, while formulating arrangements for processing of agricultural produce and for inducting agro-based industries in the rural sector, cave has to be taken to see that such arrangement not only offer processing-marketing services but at the same time they invovle the farmers in these arrangements.

In this contact the conclusion that increasingly processing of agricultural commodities will have to be undertaken in the cooperative sector in inescable. In a subsistence economy life ours integration of cooperation services with agro-based industries is vitally important, if the farmers have to grow vigorously and steadily. Typing up of the functions relating to agricultural extension services with agro-based industries is thus, an important arrangement that needs to be encouraged for modernising agriculture through industry.

It is admitted on all hands that agricultural productivity can not be increased with out a suitable programme of production and distribution of improved seeds. Agro-based industries will play a role in the direction of producing agricultural inputs by undertaking improved seed farming. Establishment of agro-based industries in the economy has one more dimension. Excessive dependence on agriculture is never considerable for the balanced economic growth of an economy. Excessive dependence on agriculture

forms a vicious circle and leads to unemployment. low productivity low income and consequent low saving and low investment that is the burden of providing capital for economic growth falls heavily on agriculture alone. Therefore, it is to bear in mind the fact that there cannot be prosperity in agricultre without prosperity in industry. Interlinking of the two sectors has one more aspects continuous investment in land and adoption of improved techniques would lead to decrease in the demand for labour working on farm lands. Absorption of surplus labour released is possible only if simultaneously industries are inducted in the rural sector. In this contest the role of agro-based industries is pivotal.

Agro-based industries in rural areas have to be designed in such a way that they operate more and more as calalytic agents for development of infrastructure that would bridge the gap between rural and urban economics. They need to be looked upon primarily as an agency to pave the way for occupational shifts and for creating new social grouping which would form the basic for the creation of necessary social, cultural and psychological premises for modern industrial society on the one hand and on the other through agro-based industries avoid the tensions that excessive urban industrialisation produces. Added to this agro-based industries creat not only economic opportunity but also has the much needed self-confidence in the community of farmers. This self-confidence is of almost importance in building up new industrial and business leadership from the villages.

All that has been discussed in forgoing pages is that the two, no doubt, are mutually interdependent and the development of the one can hardly be conceived without the development of the other. But in the scheme of things agricultural development should precede agro-industrial development so that the surplus income generated in agriculture could find investment channels in agro-based industries. Thus the multiplier will operate resulting in a substantial gain in the level of production, income and increase the standard of living of rural communities.

A realistic regional planning excercises should have three essential components that is economy, people and space. Economy refers to the sector alocation and investment of resources and have direct concern with the economic growth while the social components press upon the mass involvement of the people. The spatial component has been later taking into account because previously it was through economic growth atomatically benifit the all section of the society but it could not happen and now it perceived that the fruits of Socio-economic development can only be filtered down by organising the activities keeping in view the all cross and cons of the space. It is, however, true to state that agro-industrialisation rairly provides opportunity to attain these objectives. It is because of the fact that agro-industries are basically organised by evaluating the patttern of regional or spatial agro-resources.

Agro - Industries Conceptual Framework :

With the pivotal role played by the agro-industries in the national economy, it is necessary that various concepts associated with it and clear-cut demarcation of areas need to be precisely defined with view to lay need based emphasis on the areas of immediate importance, and to plan a phased growth of different catogories, of the industries. Considerably standardization effort has already been put in by the Indian standards Institution and there is a need for implementation of standars and joining the Indian Standards Institution Certification Marks Scheme by the agro-industrial units. This would not only help in fostering consumer confidence but would also lead to healthy growth of industry.

Presently the term agro-industries cannotes different meanings for different persons according to their expediency. However, by and for, the definition joined by the United Nations Industrial Development Organisation (UNIDO) is based on functional criteria and establishing a fairly sound basis for understanding the term. It is not uncommon to find various related expressions like agro-allied industries being used for seemingly similar concepts. However, from the following definition given by UNIDO, a logical grouping of two concept emerges:

Agro - Industries :

" The term signifies those industries which use raw material from agriculture as the main material from

which manufactured goods are produced on a commercial scale".*

Agro - Allied Industries :

The term signifies those industries which produce inputs to agriculture or even material used for protection of agricultural products.*

The term agro-industries as referred in the national context applies to "those industires which are contributing for the development of agriculture including agricultural products."These are further classified as input based industries, such as fertilizer and pesticides, and out-put based industries such as rice-milling, paper products and leather products.

Minhas had categorized various industries for processing agricultural products, producing agricultral produce and other related industries- such as storage under the broad group of agro-industries apparently without any distinction between the terms agro-industries and agro-allied industries

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* Note : 1. The term agriculture as used in this context also includes fisheries and forestry.

2. In certain cases the term 'Agro-based industries'is used to describe the industries referred to above and serves as a Synonym for agro-industires.

* Note : The term ' agro - related industries' is a synonym for agro - allied industries. distinction between the terms agro-industries and agro-allied industries.

The obvious differences in the interpretation of terms at national and international level, leaves many gaps in proper communication and understanding of the concepts. This calls for working out of the concertual ideas of the terms and their proper rationalization at national and international levels.

With a view to arrive at a rational terminology for different terms used it is of paramount importance to understnad certain basic concepts. Thus the definition provided by UNIDO restricts the scope of the term agro-industry in as much as it includes only those industries which utilize the raw material of agriculture including fisheries and forest. It does not specifically enumerates other areas of agriculture, such as animals has pandry including dairy, apiculture, sericulture, meat and poultry. Besides, the packing industry which is a part of agro-allied industry does not properly fit in the concept as this industry utilizes the raw material mainly from the forestry and its end-use extends in to agro-allied industry. Thus a more viable and clear conception should be projected to clearly democrate various areas based on utulization and functional criteria. This also leads us to certain other industries, namely, compost making where agricultural waste is mainly utilized for end-use as input, agriculture, sericulture and lacculture which do not directly utilize agricultural production.

A similar ambiguity is observed in the agro-industries concept provalent in the national contexts.

Minhas's concepts is move near to tne broad and national concept of agro-industries, though it lacks minute differntiation between different concepts discussed above.

Having considered the need for nationalized terminology for various terms denoting the utilization and functional areas it is necessary to form precise and practical concepts of different types of agro-industries. Hence an attempt has been made to rationalize them as follow

Agro - Industries

Those industries which are dependent on agriculture and / or on which agriculture is dependent.**

The agro-industry can further be classified in to following three categories :-

* NOTE :-
1. The above derination can be further clucidated, as those industries which utilize the agricultural produce for processing/fabrication of various products, process/fabricate inputs used for agricultural production depend on agriculture for production; help in protection of agricultural produce, and utilize agricultral by products and waste products for processing / fabrication of products used in agricultural production or commercial purpose.
2. For the purpose of above definition the term agriculture includes crop husbandary, animal husbandandry, dairing, poutry, agriculture, Sericulture, fisheries, oleviculture, lac-culture, rlovi-culture pomology and forestry.

Agro - Based Industries :

Those industries which utilize raw material from agriculture as the main material for processing fabrication or various products.

Agro - Allied Industries :

Those industries which process (fabricate) inputs used for agricultural production.

Agro - Related Industries :

Those industries which are dependent on agriculture such as sericulture and apiculture: those which utilize by- product or waste material for production either inputs for agriculture or commerce such as compost, feeds and oil bran or whose which help in protection of agriculture produce such as packaging,wave housing and cold storage etc.

Agro - Services Industries :

Those industires which are concerned with organisation of services and custom hiring for effective agricultural operations and management.

In the light of terminology suggested above different areas can be broadly covered under each category, as given below

Agro - Based Industries -

a) Grain Milling
b) Processed ceveals, pulses, oilseeds, tap roots and tube crops
c) Processed fruits and vegetables
d) Sugar
e) Tobacco products

f) Spices and condiments
g) Milk and Milk products
h) Meat, fish and poultry products
i) Brewery
j) Agro-based pharmacentical and cosmetics products
k) Natural perfumery products
l) 'Natural colours', flowers and preservatives
m) Cotton textiles
n) Leather and leather prducts
o) Wood processing and wood products
p) Natural gum and resins.
q) Jute and coir products
r) Paper and paper products
s) Surgical cotton and bandages
t) Drying oils for paints
u) Natural rubber and their products
v) Wool and woollen products

Agro - Allied Industries -

a) Chemical fertilizers
b) Bio-fertilizers
c) Agricultural machinary and tractors
d) Pesticides
e) Poultry equipment
f) Seeds and other propagation material
g) Coil amendments
h) Irrigation and drainage meterial such as tiles and pipes.

Agro - Related Industries -

a) Bee - keeping
b) Seviculture
c) Lac culture
d) Animals feeds
e) Compositing
f) Packaging
g) Cold storage and refrigeration
h) Warehoushing, storage bire and silos
j) Oil bran
k) Action carbon and particle board from husk and coconut shell
l) Furfural from corn cobs
m) Paper and board from ground nut shell
n) Cement for masonry mortar work from husk.
p) Cashew nut shell and shell lequid
q) Alcohal
r) Bee wax and products
s) Animal casings, surgical, brushes, gelating, glue, buttons, handles, combs, horn meal and from components, made from animal by products[2].

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2. Santwani, M.T. & R.N. Sharma,(1979) : *Agro - Industries :Concepts, Areas and Standarization*, Agriculture and agro - industries Journal, Bombay, August, Vol. 12, No. 8, pp 11 - 15.

RATIONALE OF INDUSTRIALIZATION :

Agriculture is the mainstay of the rural economy of India. Indeed, it is a primary sector of the economy which provides the basic ingredients necessary for human existence. Agriculture sector provides work to the unskilled and semi-skilled workers, particularly to those who have land for cultivation. It is a fact that agriculture is not a business proposition/industry for the people engaged in agriculture, but living a way of life (Nanavati: 1951)[3].

The importance of agricultural sector in the dualistic economy of agriculture and industry is not due to its preponderant size but also due to the peculiar production and cosumption condistions attached to the agricultural goods (Fei & Ranis, 1967)[4]. Yet, there is an essential relationship between agricultural and industrial sector, when industiral sector expands, it utilizes the man and material released from agricultural sector. It is only possible when industiral sector has better organised and integrated with space ecology.

There are various agricultural products which can not be utilized directly with out processing and converting into other purified forms or manufacturing goods. That is why are process sugarcane for getting sugar, cotton for

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3. Nanavati, (1951) : *M.B. Readings in land Utilisation*, The Indian Society of Agricultureal Economics, Bombay, p.2.

4. Fei, C.H. & G. Ranis, (1967) : *Development of the labour Surpluses Economy*, Theory and Policy, Scond print, p.155

cloth, fruits, vegetables and animals products for a large variety of goods. Of course, in an agricultural country where gigantic raw agro-products are available and has capacity to convert these raw-product into processing goods, generate move wealth and has better chance of improving its economic status.

In India, population pressure in increasing rapidly but our agricultural progress does not keep pace with it simultaneously. So it becomes requisite to us to increase and diversify our manufacturings at a rapid rate converting various agricultural products into a large variety of agro-industrial goods. This conversion of raw agricultural products increase the value or primary product and encourages the economic status from bottom to top. But due to the under-developed nature of secondary and tertiary sectors, surplus man power and raw material released from primary sector, are not being utilized properly. Of course, in the agricultural countries, the lack of vigour, vitality and progress of regional and national economics are inescapably bound up with unsatisfactory conditions of the inhabitants of agricultural village community. (Johnson, 1970)[5]. So dualistic base of the Chinese ideology i.e. 'march on two legs ' (Agricultue & Industry) seems appropriate for developing countries (Buchanan, 1970)[6]. But Nicholes insisted that agricultural sector must first be

5. Johanson, (1970) : *The Organisation of Space in Developing Countries*, (Combridge mass, Haward University, Press; p. 183.

6. Buchanan, (1970) : *The Transformation of Chinese Earth* London, G. Ball, - & Sons, p. 312.

developed enough to generate sizeable marketed and marketable surpluses before any measures towards industrialisation are contemplated. In same models, industrilization or development of non-agricultural sectorr is largely determined by the rate of release of marketable surpluses from agricultural (Nandkarni, 1980)[7]. In this way, 'The best foot must be put towa d first' (Michael, 1976)[8]. Even the western country could not begin to industrialize without a remarkable growth in agricultural production (Birock). If is, but, a fact that the areas which are purely agricultural and have a few contacts with the world of industry, are the main region of poverty (Jarret, 1977).[9]

Agro-industrialization / rural industrialization was also considered as a means of transformation of rural India (Govt. of India 1963-64)[10].

The exercise on the levels of economic development in India exibits that there are some areas which are endowed with resources but are very poor, industirally. Owing to

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7. Nandkarni B.,(1980): *The Indian Rurual Problems*. Vora & company Bombay, Ltd. p.7.

8. Michael, K. (1970): 'Why poor people stay poor,' A study Urban Bias World Development, London, Tample Smith, p.59."ASPECT" Geographies

9. Jorrett, H.R. , (1977) : *Geography of Mmanufacturing* London, p.2.

10. Government of India, (1963-64) : *Planning Commission India*. New Delhi.

this, being a rich resource region (either agricultural or other resources), the living environment of the people is deteriorating day by day. Jorret (1977)[11], stated that the higher standard can only come about through industrialisation and industrialisation is by and large dependent upon increasing supplies of raw materials released from primary sector. Thus, the development can be achieved through agro-industrialization.

INDUSTRIALISATION :

Industrialisation has been defined as a process in which changes of a series of strategic production functions are taking place. It invovlves those basic changes that accompany the mechanization of an enterprise, the building of a new industry, the opening of a new market, and the expliotation of a new territory. This is, in a way, a process of "deepening" as well as widening of capital" (Charg, 1974)[12]. Hansen defines the deepening process as one where "more capital is used per unit of output, while the widening process means that capital formation grows pari passu with the increase in the output of final goods"[13].

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11. Jarrett, H.R. Op. cit, p.8

12. Pei-kang Chang, (1974): Agriculture and Industrilisation, p.69. S.C. Kuchnal, The Industrial Economy of India, Allahabad, p.1.

13. Fiscal Policy and Business cycles, p.355.

In other words, this process raises the productivity per worker in the country. Staley marks an association between industrialization and the high productivity which makes high average incomes. " The two are parts of an inter-linked process; one does not proceed very far without the other. It is equally true to say (i) that high productivity produces industrialization produces high productivity." It is in this sense that some writers, such as condlife and Rosenstein-Rodam, have viewed industrilization as an alternative to emigration for solving the problem of over-population and of raising the national income in economically less developed areas. It is also in this sense that industrialisation and agrarian reconstruction in under-developed areas are considered as the inter-connected parts of one problem.

Chang, while defining industrialization as a process in which changes of a series of strategical production functions are taking place, analysed the concept of 'strategical production function' by refering to the history of the past two centuries. During this period strategical innovations have brought into being and intensified a proces which is termed as 'industrialization'. Most note worthy of these innovations are: use of steam engine, railways, steam ships, electric power, indtroduction of machines to manufacturing industry and agriculture and recently the atomic and sputnik power. Such innovations have further brought the organizational changes accompanying the rise of the modern factory system. Hence they have basically

characterised, and certainly will continue to characterize, the process of industrialization.

Industrialization is also treated as a process in which the economic gains of industrial progress, mainly in the nature of increasing returns, are continuously created and wholly or partially realised. Besides, industrialization lifts the margin of diminishing returns. Increasing returns. Increasing returns may be realised because of internal economics, or external economics, or both. Under a particular state of technology, there is a certain scale range of increasing return for an industiral enterprise or an industry. But a new technological innovation will prolong the scale, or enlarge the range of increasing return for an industrial enterprise or an industry. These industrialization is a process in which scales and ranges of increasing returns are continuously created, and frequently prolonged and enlarged.

From the Western experience and of laterby the experience of Japan, it is beyond doubt the imagination that industrialization can drastically changes the material standard of a society. All societies should have remained dependent upon agricultural for quite a long period.

It was by industrialization that they become developed countries. Industrialization is, thereofre, necessary for economic growth of a country. It is as a matter of fact an essential stage of development. The people of the have not nations of the world, therefore, believe industrialization as the ponacea of economic growth (

Mountjoy, 1971),[14], like many Asian countries, India is also trying has best to go for industrialization because it is the way of economic growth. India needs it for the obvious reasons of poverty which is so widespread and intense.

Industrial revolution started in Great Britain and spread towards Europe and then to North America. Now the whole North comprising of the nothern part or the inhabited earth is industrialised and the south with the bulk or world's population has to be industrialized. As the government and the people of these countries have strong urge to be industrialized, they shall do so in due course of time but they have the problem of poverty and poverty of capital.

AGRICULTURE AND INDUSTRIALIZATION :

It is unreal to consider agricultural development and industrilization separately. Improvement in the productivity of agriculture is one of the most important nears of promoting industrialization. In fact, unless agriculture is modernised substantially, industrial expansion in most under-developed countries is likely to proceed at a slow speed. At the same time, agricultural development can not be achieved substantially unless there is industrial development. In the short run, the relationship may be competitive since the assistance given by state to one sector of the economy may be at the expense of the other. But in the long run, which is of prime

14. Mountjoy, Alam, B., Op. cit, p. 63.

importance. it is complementary. It has been marked in the economic history of many industrialized countries that improvement in agriculture fastered and smoothened the way for the evolution and growth of industry. The leading industrialized countries of today were once predominantly agricultural, and economic historians have traced the various ways in which a prosperous and expanding agriculture formed that basis for the concument or subsequent establishment and expansion of manufacturing (Baur, 1974).[15] Further it is claimed that close inter-dependence of agriculture and industry has always existed in an economic society, although its patterns have undergone many changes in the process of economic evolution.

The agricultural sector serves industry in various forms: (i) it provides a large part of the sustenance for the growing urban populations (ii) it supplies a market for manufactured goods brought out of higher real incomes and a source of foreign income to pay for important capital goods for industry; (iii) it provides a source of capital for industry through the medium of cpaital accumulated by trades; and (iv) it leady to a growth of excnange economy which acquiants larger sections of the population with the process and ways of such an economy and provides opportunities for those enterpreneurial and administrative skills. All those developments promote the growth of manufacturing industry. The development of agriculture, simultaneously with, if not in advance of, manufacturing is

15. Bauer, P.T. & B.S. Yamey., (1974):The Economics of Underdeveloped Countries, p.235.S.C. Kuckhall, The Industrial Economy of India, Allahabad, p.3.

needed to achieve economic progress and avoid structural disequilibria which may later be the source of hardship. Over rapid and unbalanced growth of the industrial sector, unaccompanied by complementary changes in the agricultural sector may give rise to phenormena which in the long run are likely to retard economic development-balance of payments difficulties, inflation: excessive urbanization, the disruption of accepted social patterns[16].

In April 1963, Rostow (the noted American economist and author of the stages of Economic Growth), in his lecture on Nationalization of the Take-off' delivered at the Institute of Economic Growth, New Delhi, observed that agricultural output was the basic working capital in the large sense of either serving to generate exports or preventing to dissipate foreign exchange in import for food and other agricultural products. Due to the absence of providing adequate allocation of resources to agricultural development, most of the devloping countries were not in a position to bring themselves in to take-off and were faced with quite remarkable enclaves of industrial and urban modern activity coincident with the existence of stagnation. Nationalization of the take-off for such nations involved a process by which the effctive absorption of modern technology in limited sectors and regions of the country could be diffused over the race of the whole developing country.

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16. United Nations Report, *Process and Problems of Industrialization in Under Developed Countries*, p.3

It is thus unreal to think of agricultural development and industrialization as conflicting in a long-tern programme. Industrialization is inseparable from substantial, sustained economic advance, because it is both a consequence of higher incomes (people spending relatively more on manufactured goods and serves, relatively less on food) and a means to higher productivity.

With refrence to India, industrialization means growth of the number of modern factories so that they find regional expression in industrial areas and finally industrial region. Factory Act of 1948 and includes on enterprise employing at least 10 persons and using power or one employing 20 persons without the use of power. In a memorandom submitted by Soviet delegation to the UNESO in 1963, the definition of industrialization with particular refrence to India is a Industrialization is a system of economic development in which the major part of the national resources are used 16 develop a technically up to - date, diversified national industry capable of assuring a nigh rate of growth for the economy as a whole and of overcoming economic and social backwardness[17].

Having the glorious cottage industry in the past, India's modern industrialization started around mid-19th century. It was during 1850-55 that first railway line between Bombay and Thana was laid, first telegraph service opened and modern type factory come into existence. All this started with Bombay as centre, it being important port

17. Shirokow, G.K. 1973: ' Industrialization of India' Moscow, p.8.

having contact by sea-route to Europe. However, modernization and industrialization of

Majumdar commenting on the economic history one centry between 1850-1950 has observed that the progress of industrialization was very slow and general economic growth was also very slow[18]. The industrialization during this period according to spate was very irregular in time, space and internal structure[19]. However, India entered the second half of the twenteith century with good raid network, stable political situation and well organised administrative system.

The real industrialization of India started since the beginning of the Five Year Plans. The national government planned for the economic growth of country. After the completion of two plan, industrialization started move rapidly. There was another period of rapid growth of industries since 1970 and now industrialization is increasing at rate of move than 8 percent per annum. This has been the result of the socio-economic efforts and of the development of basic infrastructure.

THE DATA :

The present study is based on secondary sources or data. The data may be devided into two broad groups. First group is related to the measurement of the patterns of agricultural resources and industrial infrastructure. The

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18. Majumdar, R.C. etal (1948):An dvance History of India,London, p.899

19. Spate, O.H.K. Op.cit.p. 331 London, p.331.

second group of data pertains to the regional patterns of agro - industrialization.

The data for the present study have taken from the following sources :

1. District statistical Hand book of Muzaffarnagar, District, 1989.

2. Industrial Directory, 1989, prepaired by District Industries Centre, Muzaffarnagar.

3. Industrial Directory,1990, prepaired by The Inspector of Factories, Muzaffarnagar.

Besides published matrials, unpublished records have also been used wherever needed and round suitable.

THE MAPPING AND PROCEDURE :

For the measurement of agricultural infrastructure, the canals, the tubewells, agricultural implements (harrows, cultivators, wooden and iron plough, tractors, and threshers), fertilizers- seed depot, bio-gas plants, financial institutions, goods, markets and electricity have been taken into account. Blockwise z-score were calculated from the absolute values or the above mentioned indicators. The z-scores were then added to know the position of the blocks in the district. The blocks were classified into four categories of very high, high, low and very low. On the basis of these categories the maps were prepared.

To know the regional patterns of agricultural output of different important crops in the district, the real production of the crops was converted into precentages and mapped with the help of choropleth.

The analysis of surpluses of different important crops has been carried out by using an appropriate methodology. First of all 16.8 percent deduction has been made from the total production to compensate for seed and wastage. Further, on the basis of assumed overages, the total blockwise comsumption of the entire population of one year was calculated and then compared with the total production of that year to find out the cropwise surplus.

The spatial pattern of industrial infrastructure has been analysed into four sub-parts of market, capital transport and communication and power.

For the delimitation of the market area, the twenty urban centres of the district have been taken into consideration and their degree of influence has been meaasred with the help of their population size. The degree of extent of influence is determined by the total area of the market centre and the total population of the area. The actual relationship can be represented by the following equation :

$$\text{radious of the market influence} = \sqrt{\frac{\text{Total area of the region} \times \text{Total population the market}}{\text{Total population of the area}}}$$

The radious of the circle will thus measure the extent of influence. The greater the radious of the circle the larger will be the extent of influence.

Except the twenty urban centres, there are fiftone periodic markets which have been analysed at the block level in the district.

For the analysis of the capital, all the financial institutions falling in the region have been taken into account.

The transport network has been worked out on the basis of the density of metalled roads. The density of these roads have been calculated using two seprate factos, one being road length per one million population and the other road lengt per thousand squar kilometres.

The infrastructuralaminities includes the post and telegraph office, railway station, bus station, bank and market. The major factor in this analysis is the distance. On this basis villages have been categoried into three groups:

(i) less than 11 cm
(ii) 1 - 3 Km and
(iii) more than 3 Km.

Analysis of the existing power lines help in deciding the power consumption both in the public sector as well as in the private sector. This part also includes the electrified villages and the distribution of bio-gas plant.

Regional patters of agro-industrialisation has got two divisions , first is the agro-industrial structure and second is existing patterns of agro-industrialization. For the agro-industrial structure the data have been categorised into twenty types of agro-industries. Indentification of the substantial types of agro-industries is done by measuring the magnitude of all twenty types of agro-industries by labour, capital investment and number of agro-units (converting into small scale equivalent on two seperate bases):

1. Average fixed capitalsize per unit (AFCS/UNIT) is used for calculating small-scale equivalents of large-sciae units. This base is very important in case of large scale and small-scale industries as it move often governs the components of industrial magnitude. It were also available for all the units in question. AFCS/Unit of small scale sector is Rs. 2.5 lakhs while that of large scale is Rs. 125 lakhs. One large-scale unit thus has 50 small-scale equivalents.

2. Average labour size per unit (ALS/UNIT) is the base for calculating small-scale equivalents of tiny units. No other criterion could be used for tiny unit conversion due to non-availability of comparable data of the small-scale and tiny sectors. Besides, labour size assumes significance in these two sectors and represents industrial magnitude more truely. ALS/unit of tiny

sector is 2.4 persons while that of small scale is 60 persons. One tiny unit's small-scale equivalent thus comes to .04 , or say, 25 tiny units equal 1 small scale units (60/2.4)[20]. Small-sclae values having thus been known, magnitude of each 20 types of agro-industries was calculated as an index called composite Inden or the Magnitude of an Industry (Cimi). Cimi may be expressed as follows:

Reduced Score (R) = (.04.Tu + 1.Su + 50 .Lu)

Where

R = Reduced Score of tiny, small and large scale units;

Tu = Number of tiny units

Su = Number of small units

Lu = Number of large units

Cimi = R + rL + rC :

R = Reduced score of tiny, small and large scale units.

rL = Reduced score of labour of the agro-industry.

rC1 = Reduced score of capital investment of the agro-industry.

Cimi = Composite Inden of the magnitude of an Industry.

For identifying the existing levels of agro-industrial development, three items of data are used. These three items are :

20. Rawat,D.S., (1989) : Initial Agrarian Industrial structure-A case study of the Indian District of Muzaffarnagar, Geographical Observer, vol. 25, Meerut.

(i) Number of agro-units.

(ii) Amount of fixed capital

(iii) Number of labours

These are used separately as well as by their composite index. All items of data are reduced at 100 using the following formula :

$$Cf = \frac{100}{Av} \times T$$

where,

Cf = Converted figures.

Av = Average of the column,

T = Values of the individual items

This shows the composite level or agro-industrial development. Each item is also taken separately to demonstrate the level of agro-industrial development and their spatial patterns.

Maps showing spatial patterns or agro-industrialization have been prepared with the help of proportional circles have been dawn separately to show labour, capital investment and the number or agro-units. The final and more redistic picture of agro-industrialization patterns emerges with the help of composite index of agro-industrialization, as it show, the effect of all elements of industries. The composite level of agro-industrialization is represented with the help of choropleth maps.

CHAPTER - III
A REVIEW OF THE AVAILABLE LITERATURE

Agro-industries play a very important role in the economy of an area and are helpful in the economic upliftment of the people. Locational factors, such as raw material, power, labour , market and transport are the essential ingredients for the development of industrial sector.

Studies pertaining to agro-industries are not new for academicians. Such studies have been conducted by the economists, geographers and planners in many of the developed and developing countries of the world.

Studies related to agriculture-industry relations can be classified into two groups:

1. Studies related with classical political economy, and

2. Studies related to non classical paradigm.

The political economy framework adopted itself flexibily to incorporate the varying institutional conditions within which operate the processes of generation, appropriation, distribution, and utilization of surplus, while new-classical theories focus on relative price-guided allocation of scarce resources by atomistic 'agents' acting on competitive markets.

The structure of production and exchange relations in a predominantly agrarian society on the threshold of capitalist development always determines the shape and framework of classical political economy. The new-classical theory has a radically different approach to the analysis of production and exchange relation and a different theoritical structure.

Sir William Petty (1691)[1] in his writing '***Political Anotomy of Ireland***', followed the path of classical political economy. He is of the opinion that with settled agricultural communities increasing commercialization of economic activities through trade, the emergence of towns and cities as well as administrative and political structure, to manage public policies, the notion of a web of interdependent economic activities, forming a system took shape.

Smith (1976)[2], in his book ***An Enquiry into the Nature and causes of the Wealth of Nations,*** directly attacked on agriculture-industry relationship. He took this issue with the dynamics of the

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1. Petty, Sir William, (1961) : ***Political Anatomy of Ireland***,London, In Economic Writings (ed.) Hull.
2. Smith, Adam, (1976) : '***An Enquiry into the Nature and Causes of the Wealth of Nations***',(ed.) Cannan.

process of capitalist development from predominantly agrarian society. There are changing relationship between agriculture and industry. the agriculture - industry dichotomy itself emerge with different contours. with different degres of clarity, depending upon the extent or specialization of division of labour and the character of institutional property. In early periods mostly producers had their own means of production and also employing their family labours for catared to the variety of their own needs.

The distinction between agriculture and industry did not emerge sharply. With the growth of agriculture surpluses, the nature of interlinkage between industry and agriculture have changed due to the progress of the technology and greater variety of industrial inputs. As soon as agriculture-industry relation emerged in to a new shape, agriculture and its degree of commercialization increased . new production appeared in the market and agriculture has been linked with industry. With the advancement of capitalist relation in agriculture and industry, the relation between agriculture-industry itself transformed radically and the contents of concepts such as 'Net Product', 'Capital' and 'Real wage' altered. A smith also recongnised that industry contributes to net product. The surplus based approach of Smith has its special significance

because it is an important provider or subsistence. food being the major components of wage goods. In the words of A. Smith the annual labour of every nation is the rund which originally supplies it with all the necessaries and conveniences of life which it annually consumes. and which consists always either in the immediate produce of that labour, or in what is purchased with that. produce from other nations. Further he presented a natural gradation of commodities and emphasised the role of agricultural surpluses for accumulation. He is of the opinion that the ability of industry is also to contribute productivly to surplus which enhance further industrial activities. Day by day agricultural commodities are used in different industrial activities. Hence the relation between agriculture and industry was viewed by Smith in terms of the symbolic relation between country and town, where the country supplies to towns with necessary substance and the materials of manufactures. The town repay this supply by sending back a part of the manufactured produce for the population inhabited in the countryside.

According to Smith Agricultural surpluses. thus where seen a necessary prior condition for industrial expansion. While the interlinkages between agriculture and industry were seen to grow in mutual interdependence and capitalist relations to advance industry rapidly. He was much concerned with the distinctive and changing

institutional forms in agricultural property relations.

Classical writers believe in the inter-connection within the economy through tracing the circulation of commodities. Labour has its unique position in all types of economic productions whether they are of agricultural productions or industrial productions. By employing labour 'raw materials' are converted into industrial products. The value hidden inside the raw product comes out with the application of the labour and its efficiency. Agriculture dominates, as a major producer and providing a critically essential components of sustenance as a major activity, where surplus is generated, a very little capital is needed for further agricultural production in comparison to an industrial production. It is the artisan who converts the agricultural produce into an industrial products , according to the needs and demands of the society.

Richard Centillon (1785)[3] presented a more comprehensive study in his paper entitled ***Essay on the Nature of Commerce.*** He analysed the employment and output effects of landlord's consumption and the historical growth of commodities, leading to the growth of towns and cities.

Ricardo, (1817)[4] worked out on the relationship of

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3. Santillon, R., (1785) :- ***'Essay on the Nature of Commerce'.***

4. Ricardo, D., (1817) : ***Principles of Political Economy and Texation*** 'Work', Vol. I (ed.) P- Snaffa (1951).

agricultural and industrial activities. and he was of the opinion that farmar's profit in agriculture is very important. which may lead to industrialization.

Kaml Marx (1867)[5] in his book *'Capital'* Made a comprehensive study on the relation of agriculture and industry. The noted economist, has put his attention on the capitalist system. He continued his ideas with the basic structure of value and distribution, wages, strength of the workers, available technology, the state of the reserve army of labour and the capitalist perceptions of prospects of accumulation. Smith, Ricardo and Marx, treated mobility of capital and labour as the prime characteristics of competition. Marx quoted the example of England and believed that the capitalist relation would ultimately engulf agriculture as well as industry with concentration of property in land, proletarianisation of peasants, large productivity gains of capitalist agriculture and displacement of labour previously engaged in small holdings and artison manufactures .With the process of capitalist development, Marx has been underlined the important structural changes in agriculture that were symbiotically related to the advance of industry.

In contrast to the political economy framework,

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5. Marx, K., (1867) :*Capital*, Vol. I, (London), Vol.II (1885), and Vol.III (189), (ed.), Englas, London.

the neo-classical paradigm focuses on relative price guided allocation of scarce resources. The economy analysed in terms of decisions of individual agents (producers and consumers) with given endowment of resources and in persuit of the objective of maximisation of returns as their resources, given the feasible options of allocating these. Neo-classists (Sraffa, Keeynes and Engels) believe that all agents (producers and consumers) have decision making power and basis of choice for entering in a market. Political economist have recognised varying nature of the agriculture-industry relation in specific character of conditions of production and production relations in agriculture. As institutional factors are added to the system, the existing process of industrialization changes while the neo-classists conceptualise the economic process as one way avenue essentially focuses upon the resource allocational issue. The typical problems of agriculture-industry relation arise in the context of the process of accumulation, the relation itself envolves with the pace of capitalist development. In the case of developing economics like India, the principle of political economy has been reviewed with same force.

Meek, (1962)[6] in his famous work, ***The Economics of Physiocracy*** have made important contribution in this

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6. Meek, R.L., (1962) : ***The Economics of Physiocracy***, London.

field while Queshnay (1763), and Turgot (1766) directly attacked on agriculture-industry relationships.

Sraffa, (1961)[7] in his book ***Production of Commodities by means of Commodities*** has analysed the farmers rate of profit while going through the agriculture-industry relation. Hoyle, (1974)[8] linked the agricultural and industrial development with the promotion of interdependent aspects.

Krishan Bhardwaj presented a paper on ***Agriculture-Industry and Economic Development in a Historical prospective*** at the eight world congress of international Economic Association, New Delhi held in December 1986. His other papers related to the field are ***Classical Political Economy and Rise to Dominance of Supply Demand theories*** contributed in 1976 and third paper ***Towards a macro Economic Framework for a Developing Economy***in 1978, fourth paper. ***A View of Commercialization in Indian Agriculture and Development of Capitalism***' appeared in 1985 in the journal of peasant studies. Gavegrani,(1984)[9] wrote a paper on '***Value and Distribution in the classical Economicsts and Marx.***

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7. Sraffa P. (1961) : ***Production of Commodities by means of Commodites***. Combridge.

8. Hoyle, B.S., (1974) : ***Spatial Aspect of Development***. John Willy & sons, London, pp. 39.41.

9. Garegnani, P. (1984): ***Value and Distribution in the classical Economists and Marx***. Oxford Economic Papers, 36.

Singh. (1970)10 contributed a paper on '***Interrelationships Between Agriculture and Industries in U.P. Techniques of Aanalysis for Backward Regin.***'

Mukerji. (1976)[11] in his paper entitled ***Industry-Agriculture Relationships'*** explained the integration of both sectors more comprehensively.

Singh & Pannu (1957)[12] wrote a pepr on the relationships of agriculture and industry

The Cotton Textiles Industry is among the oldest and the most developed of the agriculture based manufacturing industry in India.

Iyengar. (1930)[13] studied the growing cotton mill industry in Coimbatore in all its aspects from Supply of raw materials to the disposal of the finished goods.

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10. Singh. A.K. (1970) : ***Interrelationships Between Agriculture and industries in U.P. Techniques of Analysis for Backward Region.*** Indian Journal of Regional Science. Vol. II. Number 1.

11. Mukerji. K., (1976) : ***Industry-Agriculture Relationships'*** Regional Development and planning (Strategies and Case stdies). Vole. VIII. No. 1 & 2. Edited by K.G. Bagchi & C.R. Pande. December.

12. Singh. R.L. & S. Pannu (1957) : ***The Saryuper Plains. Study in Agro-Industrial Relationships*** National Geographical Journal of India' Vole 3/3. 1 to 4.

13. Iyengar. (V.V.) (1930) : ***The Mill Industry in Coimbatore.*** Journal of the Madras Geographical Association. p.283

Lokhnathan. (1936)[14] presented a more comprehensive study of the prevailing trends of growth of the cotton mill industry in the country. He investigated the couse of its heavy concentration in a few areas like Bombay and Calcutta in the 19th century.

Another study of the Coimbatore cotton mill industry was made by Narayanas Swami. (1941)[15].

He traced its history dividing it into three phases: pre-war, past-war, and past-pykara dovelopment: and described the main features of the industry such as yarn and cloth production, location mills and the labour problems, and assessed coibator's position in the cotton textiles industry of the country.

Basu. (1961)[16] made a comprehensive study of the problems of jute industry. He considered the price fluctuation of raw jute as the greatest deterrent to stability and suggested that economy prior to jute growers would be a major incentive to the industry.

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14. Lokhnathan. P.S., (1936) : ***Recent Trends in the Distribution of Cotton Mill in India.*** Journal of the Madras. Geographical Association. 11 p(3).

15. Narayana Swami. S., (1941) : ***The Cotton Mill Industry at Coimbtore.*** Calcutta Geographical Review. 3 .(2).

16. Basu. M. (1961) : ***Recent Problems Facing the Jute Industry in W. Bengal.*** Obs. 7.

Tiwari. (1961)[17] worked at the operation of economic factors such as freight charges, distance from the cane supply centres and the mode of transport in the selection of site for the sugar factory. He found the proximity to the supply zone as the major attractive force in the location.

Khan. (1961)[18] studied the tea industry of India covering if all respects. He dealth the history of development of tea cultivation, volumes of production and share of the tea industry in India's foreign trade.

Singh. (1963)[19] explored the textile industry in Punjab and observed a rich agricultural resource base which could support a large number of industries in the region. In a recent appraisal of the cotton mill industry of Coimbatore district Mahdev. (1968)[20] focussed attention on its trends of growth.

Banerji and Basu. (1968)[21] traced the evolution of

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17. Tiwari, R.N., (1961) : ***Location of Sugar Mill.*** The National Geographical Journal of India, 4.

18. Khan, M.N., (1961) : ***Tea Industry of India.*** National Geographer, 4.

19. Singh, J.P., (1963) : ***Prospects of Textile Industries in Punjab.*** Indian Geographical Journal, p.15.

20. Mahdev, P.D., (1968) : ***Sugar Industry in India.*** Abstracts of papers of the 21st International Geographical Union Congress New Delhi.

21. Banerjee, B and Basu, D.,(1968): ***Evaluation of Indian Cotton Industry.*** Abstracts of papers of the International Geographical Union Congress, New Delhi.

the cotton textile industry. They recognized it as the largest single organized branch or industry in India, employing about one-third of the total industrial labour and accounting for about one-third or the total industrial output in terms of value. The authors also linked the growth of the cotton mill industry with the development or the railways and two world wars which have given incentives to the industry.

Dayal, (1968)[22] in his study or the major trends in the development of the sugar industry, listed the main problems due to which the industry suffered, including the irregular supply of cane, low yields, low sucrose content and a short crushing season.

Majid, (1968)[23] devoted his attention exclusively to the problems or sugar industry in Bihar. He thought that the industry could prosper if the prices or cane are regulated in reation to the needs at home and the competitive prices abroad.

Tiwari, (1968)[24] discussed the problems or sugar

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22. Dayal, P., (1968) : ***Sugar Industry in India,*** Abstracts or papers or 21st International Geographical Union Congress, New Delhi.

23. Majid, S.A., (1968) : ***Sugar Industry in Bihar.*** Abstracts or the papers or 21st International Geographical Union Congress, New Delhi.

24. Tiwari, C.B., (1968) : ***Sugar Industry in Eastern U.P.,*** Abstracts or the papers or the 21st International Geographical Union Congress, New Delhi.

industry in Eastern U.P. He thought that the dispersal of sugar mills was essential for the economic balance in the region.

Dixit (1963)[25] traced the growth or the paper industry, analysing the role or the supply or raw materials and water in the location of factories.

Rao, (1930)[26] presented his comprehensive survey of the common home (Cottage) industries or the coimbatore district, which include hand-spining, handloom weaving, Khadi, agriculture , silk weaving and Crops and metal industry. The problem of the cottage industries of Malaban were studied by Rao in 1932[27].

Rangappa (1957)[28] examined the structure of small scale and cottage industries in Mysore state, and he observed that the state offered Vast scope for their development. Small scale and medium sized industries or

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25. Dixit, K.R., (1963) : ***Growth and Distribution of Indian Paper Industry,*** National Geographical Journal of India, 913 and 47.

26. Rao, R.H., (1930) : ***A Note on the Home Industries of Coimbatore District,*** Journal of Madras Geographical Associaltion. 5 (2 and 3).

27. Rao, R.S. (1932) : ***Cottage Industries of Malabar.*** Journal of the Madras Geographical Association. 7 (3 and 4).

28. Rangappa, K., (1957) : ***Some Aspects of Small Scale and Cottage Industries in Mysore State,*** Geographical Review of India 11(3).

Orissa were studied by Sinha in 1960.[29] He analysed the total employment, present structure and the prospective of growth of a large number of industries including glass, sugar, paper, rice and pulses mills, ceremics, Jute pressing, bailing and weavring and leather. He also attempted a critical assessment of the orricial policy regarding small scale and cottage industries.

Tiwari, (1967)[30] took stock of the current trends of the small scale industires in Eastern Uttar Pradesh, exploring the possibilities of future development in the context of the available raw materials and a ready market. He suggested the establishment of a large number of small scale industries in the region.

Badar, (1980)[31] in his book entitled ***Financing Agro-Industrial Development in India-a study of U.P.,*** highlighted the importance and potentiality of agro-industires in bringing about a harmonously balanced and integrated socio-economic development of the country. Much atention has been paid to its financial need and resources.

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29. Sinha, B.N., (1960) : ***Large Scale, Medium and Cottage Industires in Orrisa,*** Geographical Review of India, 21.

30. Tiwari, C.B. (1967) : ***Prospects of Small Scale Industries in Eastern Uttar Pradesh,*** Geographical Thought, 3(1).

31. Iqbal, A. Badar, (1980) : ***Financing Agro-Industrial development in India*** - a study of U.P.

Various important aspects of agriculture-industry integrations have been discussed in several conferences. In the spring confrence[32] of the Agrarian Land scope Research group that was held at Beamish Hall college, Durham, between 20-22 May, 1971. The guest speaker was John Thirst who, after outlining the nature of favourable 'Seed bed' conditions for rural industies within pastoral areas laid particular emphasis on the importance of local studies in the investigation of the problems.

Mr. Robert Hodarson, provided an introductory paper concerning agriculture and coal mining in Durham: (1553 - 1850). He first highlighted the progress of enclosure and continuing with an appraisal of the agrarian industrial linkages viewed in terms of land-use properties. Dr. Richard Britnell, in a discussion of the agrarian crises and urban industry (1320-1380), paid particular attention to organisational changes in internal tracts which allowed English resources of Dabous to be more fully utilized and examined economic development in and around Colchester. Blackman (1780-1870) discussing agricultura. changes in the Sheffield region considered the impact of growing urban areas on food production while Miss Susan Blake in pilot study of the British agricultural engineering industry in

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32. Proceedidngs of the Conference ***Agriculture and Industry***. *'AREA'* Institute of British Geographers, 1971. Vol. 3, No.4, p.250.

the 19th century outlined some of the problems and prospective of this neglected theme.

A two day (13-14 November, 1987) Seminar was organized at M.M.H. Colleges Gaziabad[33], in which more than twenty five research papers were presented most of them directly attacked on the real theme of agriculture-industry integration, through case studies. Now agriculture-industry integration has been recognized as strategy for rural development in India. Agriculture-Industry Integration studies are recent in India, and have attracted the geographers, planners, economists and other social Scientist.

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33. Proceedings of the Seminar., ***Agriculture Industry Integration A Strategy for Rural Development*** held on 13-17 November, 1987 at M.M.H. College, Gaziabad.

CHAPTER - IV
PATTERNS OF AGRICULTURAL RESOURCES

Land is a basic resource which attract the man for producing crops to meet their food and economic requirements. Various factors determine land resources in which land use take place (Barlowe, 1967).[1] Of course,"Not only economic activities but also social institutions,political power-structure, value system, cultural tradition..... are diverty linked to the use and exploitation of land as a productive resource." (Stavenhagen, 1975).[2] In this way, land resource use is basically related to "conversion of land from one major use to another general use ".(Nanvati, 1957).[3] Further, it is also noticed that land- utilization, is the satisfaction, which the farm population derives from the type of agriculture developed, the provision for future production and the contribution to national needs (Nanavati and Anjaria, 1951).[4] Thus agricultural land utilization is an on going process in which landusers switch the gear of agricultural land-utilization and decide as to what crop should be grown, in which ratio and quantity, in which crop order, how many animals of various classes and equipments are required and how to manage them for better utilization of agricultural

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1. Barlowe,R.,(1967): Land Resource Economics. The Political Economy of Rural and Urban Land Resources use, Prentice Hall,Inc., New York,p.228.
2. Stavenhagen,R.(1975): Social Classes in Agricultural Societies, (New York) Anchol books) .
3. Nanvati,M.B.,(1957): Readings in Land Utilization, The Indian Society of Agricultural Economics, Bombay, p.2.
4. Nanvati and Anjaria, J.T.,(1951): The Indian Rural Problems, Vova & Co.Pub.Ltd., Bombay.

land resources in order to improve their soci-economic status.

India is a country of villages, where about two-third population is directly or indirectly engaged in agricultural occupation. The nations derives its half of the national income from this primary sector of economy. Several programmes have been launched to develop the agriculture sector in order to brings the prosperity in masses. Even the so called green revolution could not boost-up the agriculture sector desirabely, and however, these programs widened the gap between rich and poor in the minmizing the gap. The maximum benefit of these programmes have been shared by a certain section of the socieity, and the resouceless section of the saocieity could not get benefit of these programmes. But one thing is obvious that there is overall improvement rather than individual. In India, spatio-temporal variation in the use of modern technology of agricultural resources base are noticed low. Application of high technology could not be helpful in bringing the overall development and the effect of low technology could not be more userul in changing the primitive methods of production. yet the area under study witnessed rich agricultural resource base as compared to other parts of India. The physical, institutional, organizational and even social infrastructural resource base of the area could be helpful in developing the agriculture of the area. Moreover, the agricultural out put, a result of rich infrastructure, is also high in the study area and when we specifically concentrate on Muzaffarnagar District to justify the study

of Western U.P., the results appear more encouraging.

AGRICULTURAL INFRASTRUCTURE :

Though the infrastructure is a very wide term but when we say agricultural infrastructure, it means the infrstructure necessary for agricultural development. In other words without whom the agriculture practice can not be successfully operative. Here the canals, tubewells, Fertilizers, agricultural implements like narrow - cultivators, wooden plough-iron, plough tractors, threshers, fertilizers, and seeds depots, bio-gass, financing institutions, roads, markets and electricity have been taken into account to analyse the patterns of agricultural infrastructure in the study area. Mauries (1969)[5] gave his views on the role of infrastructure in achieving the optimum stage of agriculture development. He emphasize the essential use of biological and machanical input particularly seeds, fertilizers, manure, mechanical power and plant protection materials. He considered these factors as effecting agro-production determinant in a given environment.

The biological technification includes the improvement of seeds, their growth rates, root penetration and adoptability to diverse climopedology environment. Its process is mainly directed towards farm research on new genetics of plants and their supports. It constituties the use of high yielding crop variations, fertilizers, plant protection materials and improved methods of irrigation for

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5. Maurice, E., (1969) : *Crop Technology*, Hutchinson Educational, London. F.A.O.,FAP Argicultural Year Book. UNESCO, Paris.

increasing the production per unit area. It is well recognized. That highly industrialized countries have doubled their agricultural production by the use of biological techniques. The machanical technification as a metter of fact. is to develop the inputs which can supplement the manuel and animal farm power such as new machines of ploughing. sowing. reaping moveing and harvesting. The use of new source of machanical power such as tractors. combines. and more efficient iron-based farm implements have revolutioned the traditional cultivation. Use of improved mechanical technique primarily results in a labour saving but simultaneously contributes significantly to increase yield per hectare by making possible more intensive cultivation and the application of modern biological techniques. Thus the efficiency of a farm workers has been multiplied. Recently food production in India has increased to a considerable extent which result in self-surficiency in food grains. This growth in agriculture is the result of certain degree of technological change and adoption of agricultural innovation. In fact the technological change in agriculture consists of adoption of new farming techniques developed at research institutes with a view to bring out diversification. increase in production and greater economic return to farmers. The use of ferilizers. improved varieties of seeds. pesticides and fungicides.improved irrigation facilities. new agricultural implements and soil and moisture conservation practices like contour bounding are some of the example of such techniques. Needless to mention that inspite of such a crucial there is

overall lack of technological change and diffusion of agricultural innovation in India. Several hypothesis are formulated to explain it. such as farmers are not properly motivated. lack of knowledge. failure of extension agencies in bringing about the change. weather uncertainties. social structure of the farmers and so on (Desai. 1966)[6]. Moreover. the availability of infrastrucutre facilities and their adoption process invovles several consideration. It is process of consistant leaning. decisions and acts taking over a period of time in other words it does not nas a conseaquent of a single decision but a series of action and through process which may be assembled into following steps that is awarness stage. the entrance stage. the education stage. the trail stage and the adoption stage (Savale. 1966)[7].

For the worthful analysis the Z-scores values of all the parametors. have been calculated. It is basically meant for the evolutations found in the distribution of infrastructural facilities and their impact on agricultural development especifically to judge the influence of infractructural facilities on agricultural progress the agregate values of Z-scores of all the facilities and the yield of a particular block

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6. Desai.D.K. and B.M. Mishra. (1966): ***Thechnological Change and Rate of Diffusion, Indian,*** Journal of agriculture Economics. Vol. XXI . p.p. 140-141

3. Savale. R.S.. (1966) : ***Technological Change in Agricultural Study of Sources and its Diffusion Efficiency of Sources and the Economic Factors Affecting the Adoption of Improved Practices*** Indian Journal of Agricultural Economics. Vol. XXII. p.199.

has been correlated. Moreover, the positive and negative role of infrastructural facilities on agricultureal development has been highlighted based on the result or the degree of relationship.

Blockwise Analysis Of Agricultural Infrastructure :

Analysing the various infrastural facilities at block level a composite picture based on Z-score values has been obtained. It depicts a very vivid picture of the distribution of infrastructure facilities in the district. The agregate Z-score values of the distrcit is (6.16). It is very intresting to note that two blocks namely Khatauli and Jansath records the higher score of infrastructural facilities than the average figure of the the district. Khatauli (13.74), Jansath (10.38) and Muzaffarnagar (6.09) show the richness of infrastructural facilities either irrigational, biological or machanical. Block Shamli, Un and Kandhala show the moderate availability of infrastructural facilities registering (3.85), (3.36) and (2.48) Z-scores values respectively. The remaining blocks Baghara, Shahpur, Purquazi, Thanabhavan, Morana, Charthawal, Budhana and Kairana register either negative Z-score values or very poor values. The poorest picture of infrastructural facilities have been noted in Kairana (-11.23) block followed by Budhana (-7.11) and Charthawal (-5.33), (Table - 4.1). Not even a single infrastructural facilities is uniformaly distributed at block level. In Kairana block excluding fertilizer depots and road all the facilities are below average depicting the negative Z-score values. The highly

TABLE - 4.1

Z- Score Values of Total Agricultural Infrastructure in Blocks of Muzaffarnagar District

S.NO.	BLOCKS	Z - SCORE VALUES
1.	Khatauli	+ 13.74
2.	Jansath	+ 10.38
3.	Muzaffarnagar	+ 6.09
4.	Shamli	+ 3.85
5.	Un	+ 3.46
6.	Kandhala	+ 2.48
7.	Shahpur	- 0.47
8.	Baghara	- 0.70
9.	Purquazi	- 1.73
10.	Thanabhavan	- 2.90
11.	Morana	- 4.73
12.	Charthawal	- 5.33
13.	Budhana	- 7.11
14.	Kairana	- 11.23
	District	+ 6.16

base Appendix 3.1

Source : Statistical Handbook of Muzaffarnagar District (1989).

rich block Khatauli. register the negative Z-score values in the availability of canals. seed depots. bio-gass and market and positive in others (appendix 4.1). Up to some extent fertilizers depot plough wood. canal irrigation. iron-plough and thresher are uniformely distributed in the area as compared to other facilities. The spatial distribution of agricultural infrastructural facilities has clearly made three separate zones or belts in North-South direction from East to west as high. low and moderate respectively. The high infrastructural facilities comprises Muzaffarnagar. Khatauli and Jansath. low Thanabhava. Baghara and Shahpur and MOderate Un. Shamli and kandhala. It is interesting to note that at the outer middle part of the reactangular

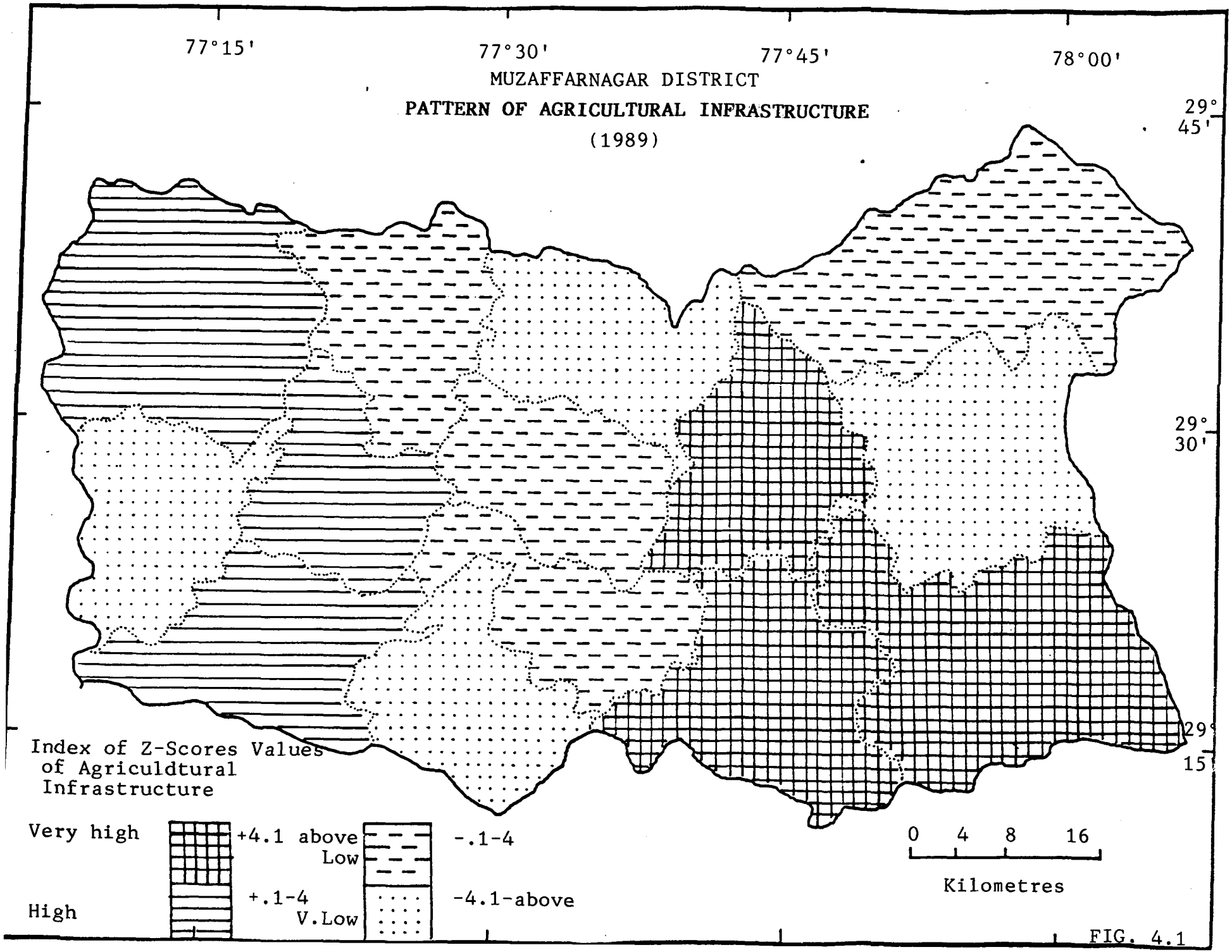
77°15'
77°30'
77°45'
78°00'
MUZAFFARNAGAR DISTRICT
PATTERN OF AGRICULTURAL INFRASTRUCTURE
(1989)
29° 45'
29° 30'
29° 15'
Index of Z-Scores Values of Agriculdtural Infrastructure
Very high
+4.1 above
High
+.1-4
Low
-.1-4
V.Low
-4.1-above
0 4 8 16
Kilometres

FIG. 4.1

figure of the study area reveals very low infrastructural facilities comprises Charthawal block in the North. Budhana in the South. Morana in the East and Kairana in the West. in comparision of the districts Z-Score values (Fig. 4.1). The distribution of these facilites has determing impact on agricultural development.

PATTERNS OF AGRICULTURAL OUTPUT:

Agricultural output is a function of multiple process which takes place in specific time and place: In agricultural output or production cycle. we study particularly the production of crop raised by farm community in districts agro-practice. In Muzaffarnagar district which is premarly and agricultural zone of Doab region, grows varity of crops. However. it is true that some of the crops have got specific attention of the farming community which by and large adjusted with the spatial economy. If we group the crops grown in the area in a broader way. two types of crops are appreciably marked. First group may be termed as food crops and second as cash crop. Food crops mainly consists of wheat. paddy. maize and pulses while the cash corop are sugarcane and potato followed by oilseeds. As far as the significance of crops is concerned wheat and sugarcane have received the specific attention of the producers.

Patterns of Agricultural Food Grain Output :

In the study area total food grain production is 4.9 lakh metricton in 1990. in which wheat's share is 60.61 percent. paddy 15.38 percent. maize 2.3 percent and pulses

1.60 percent of the toal production (Table 4.2). The spatial analysis of food grain production shows that Un block produced the highest food grain about 62 thousand metricton. followed by Purquazi 511 hundread metricton. Jansath 374 hundread metricton. and Budhana 346 hundread metricton. The lowest food grain output has been recorded in Shamli block that is 228 hundread metricton (Table 4.3).

Wheat :

Wheat is an important foodcrop produced by proper attention. As it is evident that in five blocks namely Un, Kairana, Kandhala, Budhana and Charthawal, it has attained the first position in production particularly in terms of land utilization, and in other blocks what is being grown as IInd rank after the sugarcane. It is more interesting that wheat and sugarcane are complementary to each other. Toptal wheat production of the district is 3944 lakh metricton, the highest wheat production at block level has been recorded in Un block 12.06 percent or the district followed by Purquazi 9.14 percent. Jansath 80 percent. Budhana 7.36 percent. Kandhala 7.26 percent. Charthawal 6.97 percent. Thanabhavan 6.66 percent and Kataull 6.65 percent. Shamli block produced only 192 hundread metricton or 4.87 percent wheat of the district (Table 4.3). The spatial picture reveals that excluding the corner areas of the region the remaining part produces an average wheat crop which support their need (Fig.4.2).

Paddy:

It is a second order crop in food grain

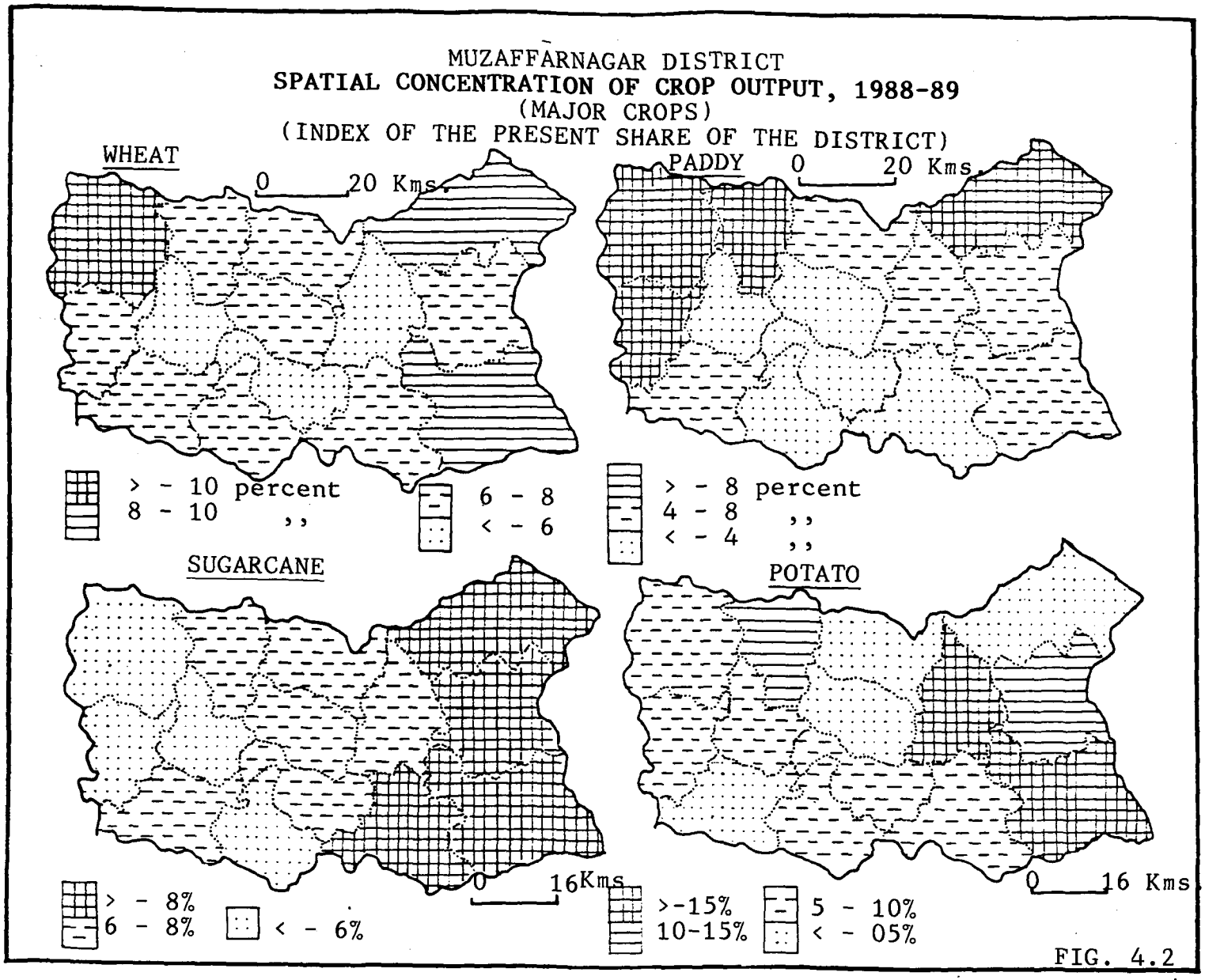
MUZAFFARNAGAR DISTRICT
SPATIAL CONCENTRATION OF CROP OUTPUT, 1988-89
(MAJOR CROPS)
(INDEX OF THE PRESENT SHARE OF THE DISTRICT)
WHEAT
0 20 Kms.
> - 10 percent
8 - 10 ,,
6 - 8
< - 6
PADDY
0 20 Kms.
> - 8 percent
4 - 8 ,,
< - 4 ,,
SUGARCANE
0 16Kms
> - 8%
6 - 8%
< - 6%
POTATO
0 16 Kms
>-15%
10-15%
5 - 10%
< - 05%

FIG. 4.2

TABLE - 4.2

MAJOR CROPS/GROUPS OF CROPS, MUZAFFARNAGAR DISTRICT, 1989 - 90

Crops:Group of Crops	Percentage Croppedarea	Production ('00. M.T.)	%
Industrial/Commercial		++++	
Sugar cane	38.07	111153	99.39
Oilseeds	0.70	21	.01
Potato	0.56	655	0.58
Food grains		++++	
Wheat	30.13	3944	80.61
Paddy	7.19	752	15.38
Maize	1.87	113	2.31
Pulses	2.73	82	1.60
X seven crops/groups of crops	100.00	++++	

++++ irrelevant for incomparability.
X insignificant Crops including in total.

Source :- Statistical Handbook of Muzaffarnagar District (1989).

production. 752 hundred metricton paddy has been produced by the area in 1990. Purquazi block shares the highest production of 140 hundread metricton which is about 18.71 percent of the total area. Un. Thanavhavan and Kairana also registered the high production of paddy that is 16.75, 14.92 and 12.30 percent respectively (Table 4.3). Jansath, Charthawal., Kandhala, Muzaffarnagar and Morana have moderate place in paddy production and moreover, rice is being grown in even rest of the blocks. The patterns of paddy crop production shows three specific zone, the high paddy production zone in western part, moderate production zone in eastern part and low in the central part of the district (Fig. 4.2).

Maize :

Maize is also a significant food crop in the area. It is grown in*Kharif* season and has effective impact on food habit of the people in the area. 113 hundread metricton. Maize was produced in 1990. Thanabhavan is the biggest producer of the district followed by Budhana 17.52.Un 15.12. Kairana 10.03. kandhala 8.92. Shamli 6.21 and Shahpur 6.09 percent (Table-4.3). Baghara. Charthqwal and Purquazi are the moderate producer of the maize while Muzaffarnagar and Morana produced 1 hundread and .7 hundread metricton maize in 1990 . The output or maize crop clearly shows the high concentration in western part of the region while eastern part is comparatively poor in maize production (Fig. - 4.3).

Pulses :

Pulses have insignificant share in crop production of the area pulses share only 1.68 percent of the total food grain production in the district. The spatial pattterns or pulses have shown separate zone of varying degree of production. Out of the total pulses production of the district Khatauli block produces the highest (13 hundread M.T.) followed by Purquazi. Jansath. Un. Charthawal. Muzaffarngar. Morana. Baghara and Shahpur with a share of 9.41. 9.20. 7.96 7.87. 7.32. 7.08. 6.83 and 5.94 percent respectively (Table 4.3). Thanabhvan. Budhanan. kandhala. Kairana and Shamli blocks produce the best quantity or pulses. Based on pulses production. the study area may be devided into two zones. the eastern and the western. The former zone produce comparatively high quantity or pulses

TABLE - 4.3
BLOCKWISE OUTPUT OF FOODGRAIN CROPS. MUZAFFARNAGAR DISTRICT
(1988-89)

S.NO.	BLOCKS	WHEAT (M.T)	%	PADDY (M.T)	%	MAIZE (M.T)	%	PULSES (M.T)	%	TOTAL FOOD GRAIN (M.T)	%
1.	Muzaffarnagar	22908.6	5.80	3392.48	4.50	112.8	0.99	605.4	7.32	27019.28	5.63
2.	Baghara	23873.2	6.05	2277.6	3.02	549.6	4.85	507.0	6.13	27207.40	5.87
3.	Charthaval	27502.8	6.97	4230.72	5.62	483.6	4.27	650.4	7.87	32867.52	6.87
4.	Purquazi	36062.0	9.14	14092.0	18.71	226.8	2.00	777.6	9.41	51158.40	10.66
5.	Kairana	25396.8	6.43	9266.40	12.30	1136.4	10.03	283.8	3.43	32083.40	6.68
6.	Shamli	19245.2	4.87	2676.96	3.55	703.2	6.21	207.2	2.50	22832.56	4.76
7.	Thanabhavan	26273.0	6.66	11234.08	14.92	2102.4	18.57	469.8	5.68	30418.28	6.34
8.	Un	47574.8	12.06	12611.0	16.75	1712.4	15.12	658.2	7.96	62556.40	13.04
9.	Khatavli	26254.8	6.65	2839.20	3.77	295.2	2.60	1283.4	15.53	30672.60	6.39
10.	Jansath	31881.2	8.08	45440.64	6.03	237.6	2.45	760.2	9.20	37419.64	9.88
11.	Morana	26171.6	6.63	3336.32	4.43	75.6	0.66	585.0	7.08	30168.52	6.28
12.	Budhana	29062.8	7.36	2672.80	3.55	1983.6	17.52	450.6	5.45	34169.80	7.12
13.	Shahpur	23535.2	5.96	2473.12	3.28	690.0	6.09	495.6	5.99	27193.92	5.66
14.	Kandhala	28665.0	7.26	3796.0	5.04	1010.4	8.92	428.4	5.18	33899.80	7.06

Source :- Statistical Handbook of Muzaffarnagar District. (1989).

than the later zone (Fig. 4.3). The district figure of pulses production for the last ten years reflect gradually increasing trend. 32.25 percent growth rate of pulses production has been noted which is a good sign but it is true to say that besides the constant increasing in pulses production it could not get the significant place in crop production of the area. However low per unit yield is very much responsible for the low production of the pulses. Farmers want to produce only those crops which are much profitable to them.

Patterns of Commercial Crops output :

In district Muzaffarnagar sugarcane oilseeds and potato are significant commercial crops. In the study area total production of commercial crops is 111.8 lakh matric

MUZAFFARNAGAR DISTRICT

SPATIAL CONCENTRATION OF CROP OUTPUT,(1988-89)

(INDEX OF THE PERCENT SHARE OF THE DISTRICT)

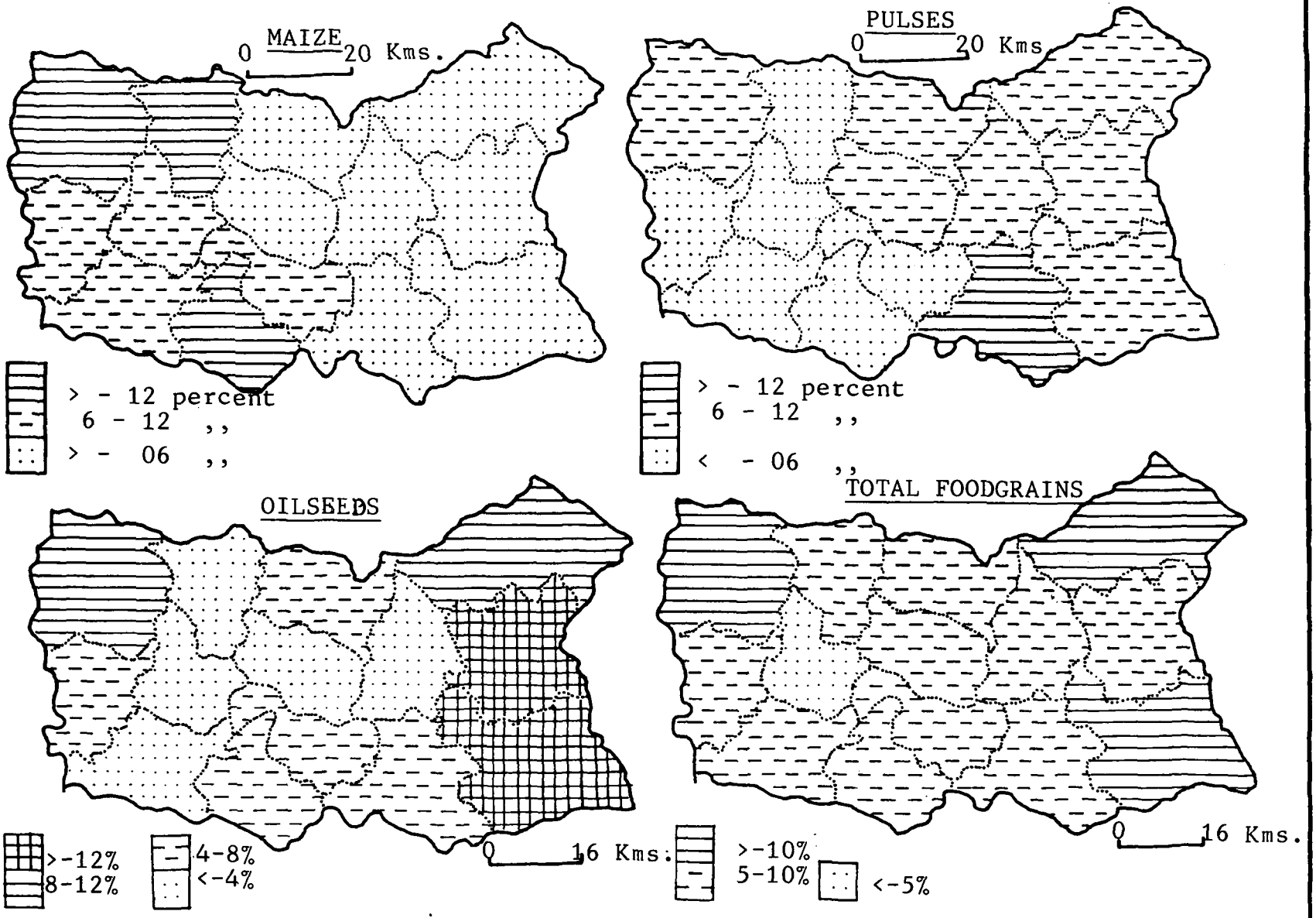

FIG 4.3

tone in 1990, in which sugar cane's share was 99.39 percent, potato's 0.58 percent and oilseeds only .01 percent of the total production (Table-4.3) Sugarcane is the most important commercial crop being grown in the study area.

Sugarcane:

It is cheap commercial crop which is being grown with greater stress in the area. Sugarcane crop ranks first in the cropping system except a few blocks where replace it. As far as the production is concerned sugarcane output has dominant role in total agricultural ou put of the area. The district has 111.1 lakh M. T. sugar cane output in 1990. Jansath blocks ranks first in sugar cane output with a total output of 12.0 lakh M.T. of the area. It is about 11 percent of the total sugarcane production the district. Khatauli (9.00) , Morana (8.48), Purquazi (8.43), Charthawal (7.26), Kandhala (7.06) Bhagara (6.99), Thanabhavan (6.86), Shahpur (6.37) and Muzaffarnagar (6. 8) percent are the other blocks where sugarcane is produced with proper cane. In sugarcane production or the area Kairana blocks registered a lowest production (Table-4.4). The spatial distribution of sugarcane output has clearly made three separate zones of production. First zone of high production includes eastern part of the district particularly Purquazi, Morana, Jansath and Khatauli blocks, the middle part of the district depicts moderate output of sugarcane, whereas the blocks lying along Yamuna river have comparatively low sugarcane out put (Fig. 4.2). Thus the sugarcane cultivation and its out put increases from west to east and concentrate highly in Jansath block where sugarcane output has been

TABLE - 4.4

BLOCKWISE OUTPUT OF INDUSTRIAL/COMMERCIAL CROPS. MUZAFFARNAGAR DISTRICT (1988 - 89)

S.NO.	BLOCKS	SUGARCANE (M.T)	%	POTATO (M.T)	%	OILDSEEDS (M.T)	%
1.	Muzaffarnagar	673206.0	6.05	10350.0	15.79	48.6	2.26
2.	Baghara	776968.0	6.99	1932.0	2.94	12.60	0.58
3.	Charthawal	807186.0	7.26	2277.0	3.47	127.8	5.96
4.	Purquazi	937164.0	8.43	1134.0	1.73	199.8	9.32
5.	Kairana	489752.0	4.40	3427.0	5.22	93.60	4.36
6.	Shamli	647976.0	5.82	3549.0	5.37	36.60	1.70
7.	Thanabhavan	763280.0	6.86	6900.00	10.53	76.20	3.55
8.	Un	662244.0	5.95	3588.0	5.47	248.40	11.59
9.	Khatauli	093706.0	9.80	4623.0	7.05	111.00	5.18
10.	Jansath	1203326.0	10.82	10097.0	15.40	478.20	22.31
11.	Morana	943544.0	8.48	7774.0	11.86	336.00	15.68
12.	Budhana	622572.0	5.60	3611.0	5.51	95.40	4.45
13.	Shahpur	708818.0	6.37	3795.0	5.79	91.80	4.28
14.	Kandhala	785610.0	7.06	2300.0	3.51	66.60	3.10
Total (Distt.)		11115352.0	100.00	65527.0	100.0	2142.60	100.00

Source :- Statistical Handbook of Muzaffarnagar, District (1989).

noted very high in the area. Moreover, this crop has high potential for its forward linkages.

Potato:

It is the input and vegetable crop being grown in the area. Its consumsption is high besides its production: farmers produce it particularly to meet their own demand. the district produced 66 lakh M.T. potato in 1990. The spatial distribution of potato output at block level shows that Muzaffarnagar block produces the highest potato of 103 hundred M.T. which constitute about 16 percent or the totaL productionof the area. 15.40, 11.86, 10.53, 7.05, 5.79, 5.51,5.47 and 5.22 percent of potato production is shared by Jansath. Morana, Thanabhavan, Khatauli, Shahpur, Budhana ,

Un and kairana respectively. The lowest potato production has been noticed in Purquazi block where the total production is about 13.3 hundread M.T. (Table 4.4). The figure (4.2) revel that South - Eastern part of the region has high output of the potato while the North East and South-West part of the region register lowest potato output.

Oilseeds:

It is very important agricultural crop which could not get the proper attention of the farmer even now. The total crop land use share is very insignificant. Total output of oilseeds crop is 21.4 hundread M.T. In the study area oilseeds are not produced independently but it is grown as a mixed crop with ***rabi*** crops. the spatial distribution of oilseeds crop production reveals that Jansath block produces the highest quantity of oilseed crop in the area it shares about 22.3 percent of the total production. Morana block records 15.68 percent of the prodcution followed by Un (11.59), Purquazi (9.32), Charthawal (5.96) and Khatauli (5.18) percent. Baghara block produces only 12.60 M.T. of the total production. (Table-4.4). The oil seeds production forms different zone of produc ion by and large. The oilseeds production and their spatial concentration (Fig. 4.3) shows relationship with the production figure of wheat crop. because what and oilseeds are grown as mixed combinational forms. Despite the low output of the oilseeds it is very important crop which is commercial and has influence upon food habits too.

PATTERNS OF AGRICULTURAL SURPLUS:

In agricultural dominant economies. the production process in terms of gross productioi and surplueses nas great influence upon the economic well being of the socieity. the quantity or surplus production or agricultural comodities changes rrom time to time and rrom area to area. the various components. particularly per capita production and degree of dmand. are the most important determinent of spatial structure of surpluses. Muzarfarngar district of western U.P., one or the densly populated area. has continuous increase of agricultural production to meet out the grown demand.

The analysis of surpluses has been carried out by using a scientiric methodology. First of all 16.6 percent deduction has been made rrom the total production or each and every comodity and further the deduction based on average/demand of the population has also been done so far. Thus. obtained figures or quantity of different crops at block level have been tabulated and computed to know the level of surpluses in the district. However. the prosperity of the farming community highly derends upon the quantity of the surpluses. Even the potentiality or agro-industrialization is also determined by the existing and future course of agro-animal surplues in any area.

Cropwise Analyses Surpluses:

Different foodgrain crops registered a varying degree of surpluses at district level. the date analyses at blocks level reveals quite different picture. Here for the

MUZAFFARNAGAR DISTRICT

SURPLUS ZONES OF CEREAL AND CASH CROPS, (1989)

(Index of the percent share of the district)

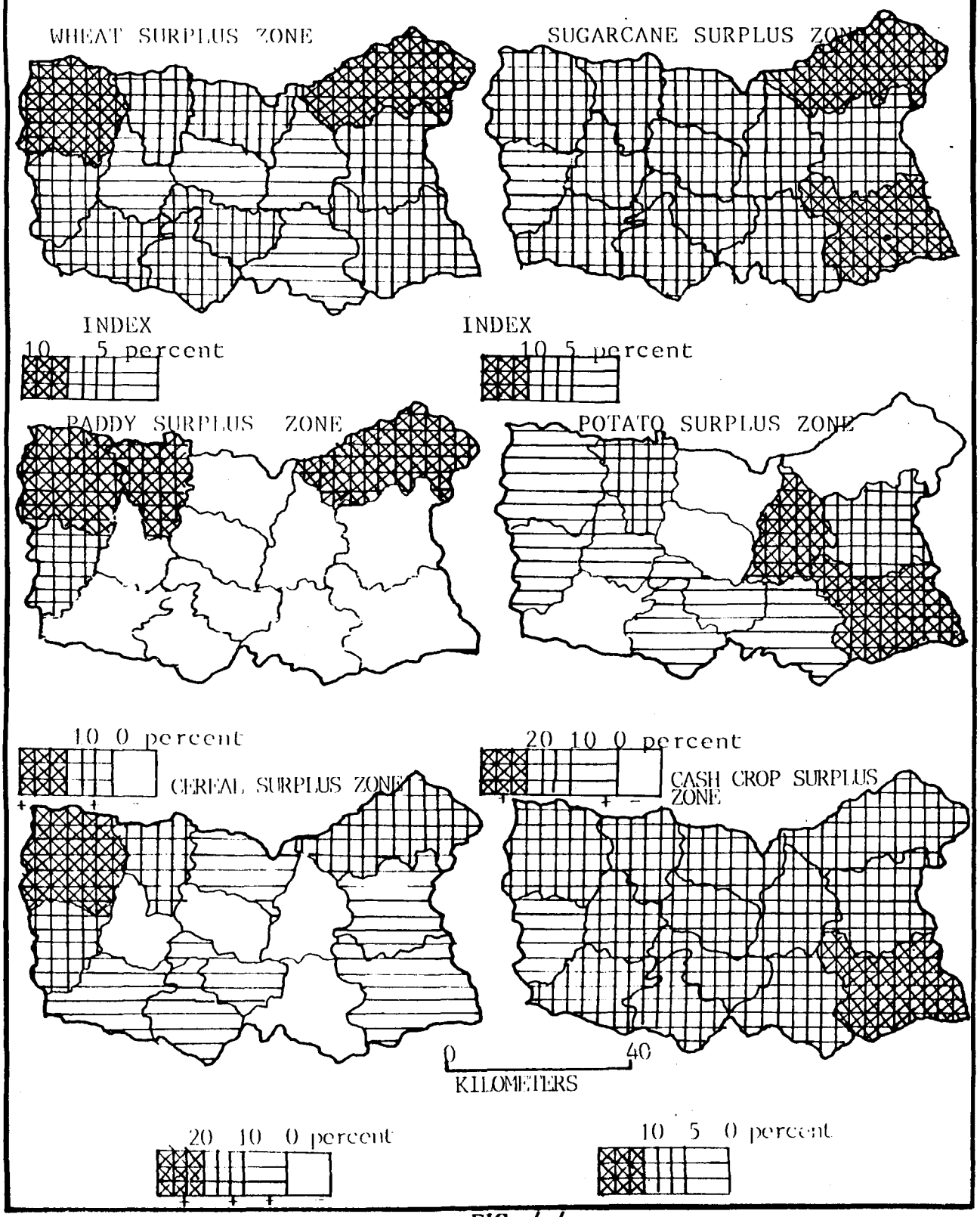

FIG. 4.4

purpose, the analyses of surpluses at block level has been made cropwise.

Wheat :

Wheat is a staple food crop being grown and consumed uniformaly through out the area. In food crop production therefore, wheat has received the greater attention of the farming community. Consequently, the area results high wheat surpluses inspite of high consumption demand. 1374.2 hundread M.T. Wheat surpluses is available at district level. Block level analyses reveals that Un block registered the highest surpluses of wheat (21.51 percent or 295.6 hundread M.T.) of the district followed by Purquazi (12.43),Budhana (8.45) , kairana (8.25), Jansath (8.18), Charthawal (7.90), Thanabhvan (7.08), Kandhala (8.54) and Morana (5.83) percentages respectively (Table - 4.5). The lowest wheat surpluses has been noticed in Muzaffarnagar block (1590 M.T. or 1.15 percent). In spite of the varying degree of wheat surpluses at block level. Muzaffarngar district evidenced handsum amount of su pluses. It may be utilized for manufacturing purposes in order to establish its forward linkages. The (Fig. 4.4) reveals that there are mainly three zones of wheat surpluses isn the district, the first zone comprises of Un block and its allied maily Kairana, Kandhala, Budhana and Shahpur in the south west and Thanabhavan, Charthawal in the North central of the region surrounding the Un from south and East respectivly. The second high surpluses zone of wheat is clearly visulaized in the Eastern part of district covering Punquazi, Morana and Jansath block in Ganga-*Khadar*. The

central part mainly Shamli. Baghara. Muzaffarngar and Khatauli blocks make separate zone. However. the gradients of wheat surpluses shows positives trend or surpluses radiating from the central part to neripherv. Wheat crop provides high potentialitv for wheat based processing industries. at different levels and. more logicallv at block cluster level to harrowness this raw resource in order to enrich the economv of the primarv producer.

Rice :

The surplus of rice crop at district level clearlv shows the deficiencv of rise. But when we analvse the data at block level we observe that four blocks namelv Purquazi. Un. Thanabhavan. and kairana registered surplus of 7436.5990. 5312 and 4455 rice respectivelv. the high surpluses of rice produced bv these four blocks minimize the degree of deficit at district level bv meeting the requirements of adjacent areas. Moreover. three of the four blocks. particularlv Un. Thanabhavan. and kairana forms a high surplus zone in the North - West part of the region.It is. however. truelv sav that both surplus zones are lving along river Yamuna and Ganga respectivelv. the rest 10 blocks are deficit in rive requirement. and have no anv surplus. It deminishes the potentialitv of padelv based manufacturing. Yet. paddv based manufacturing units mav be installed in surplus areas also because paddv crop needs dehusking. before consumption.

TOTAL CEREAL :

The district level analysis or cereal surplus and foodgrain production reveals that in the cropping year 1988-89 about 4.8 lakh M.T. cereals have been produced by the area. The surplus figure (113225.46 M.T.) or cereal is more than one fourth of total cereal production. The block level analysis of surpluses clearly show the uneven concentration of of surplus throughout the area. Wheat, rice and maize are the main cereal crops being grown in the area. The analysis reveals that maize crop production is quite low in the area as a result all the blocks fall in the category of deficit maize production. The combined picture of wheat, rice and maize reveals that four blocks of the district are in deficit in cereals. It is because of the fact that excluding wheat other cereal crops are not fulfilling the demand and registered low surplus area. Therefore, the demand of other cereal crops is completed by wheat and this trend utilizes the surpluses produces may be utilizes for processing which is beyond the consumption requirements but however, the area provides substantial base for introducing the cereal based units in all the blocks excluding the central axis comprising Shamli, Beghara, Muzaffarngar and Khatauli because, these blocks show deficit in cereal surpluses registered 2.47, 0.77 and 0.26 per cent surplus of the district respectively. Besides the handsome production of these blocks, the question arises that why the production and surplus figure, vary and moreover, why the four block of the district register deficit in spite of high production figure? It is however, true to say that the so called

deficit blocks- Shamli, Baghara,Muzaffarnagar and Khatauli record 22832, 27019, 27207 and 30678 M.T. cereal production respectively. The lowest quantity of production stress the population concentration is high in these blocks. The production of different crops does not kept pace with rising population of these blocks. The raw quantity of surpluses of cereal is also on account of poor attention of the farmers. It is substituted by cash crop particularly sugar cane. Un block records the highest surpluses of the cereal that is 34693 M.T. on 26.04 percent of the total district followed by Purquazi 22514 M.T. (16.90), Kairana 15093 M.T. (11.33), Thanabhavan 14695 M.T. (11.03) and Budhana 9125 M.T. (6.85 percent). The lowest surplus of cereal that is 3895 M.T. (2.92 percent) has been noted in Morana ablock (Table- 4.5). Thus the analysis of cereal crops in terms of surpluses reveals overall availability of surpluses (113225.46 M.T.) . which provides a substantial base for agro-based industries particularly cereal based.

Sugarcane :

The area is generally known as the pocket of sugarcane cultivation which is obivious from the fact that the lion share of the crop land is put to sugarcane production. Sugarcane is treated as commercial crop due to its nature because sugarcane is directly non consumpable crop and very insignificant quantity of sugarcane is directly consumped by the population. Therefore, sugarcane is processed before utilization and moreover, a variety of products are prepared by processing the sugarcane Muzaffarnagar district has as igroid quantity of sugarcane

TABLE - 4.5
BLOCKWISE SURPLUS OF CEREAL CROPS IN MUZAFFARNAGAR DISTRICT
(1989)

S.NO.	BLOCKS	WHEAT	%	PADDY	%	MAIZE	%	TOTAL CEREAL	%
1.	Muzaffarnagar	1590.76	1.15	-2367.8	5.18	-2513.98	11.02	-3291.02	2.47
2.	Bughara	4415.93	3.21	-3300.79	7.22	2145.32	9.40	-1030.18	0.77
3.	Charthaval	10859.94	7.90	-526.99	1.15	-1634.17	7.16	8698.78	6.53
4.	Purquazi	17088.00	12.43	7436.22	16.27	-2010.01	8.81	22514.21	16.90
5.	Kairana	11347.8	8.25	4455.28	9.75	-709.67	3.11	15093.41	11.33
6.	Shamli	3257.13	2.37	2054.29	4.49	-1560.78	6.84	-357.94	0.26
7.	Thanabhavan	9681.78	7.04	5312.43	11.63	-298.58	1.30	14695.79	11.03
8.	Un	29565.66	21.51	599.45	13.11	-862.97	3.78	34693.14	26.04
9.	Khatauli	3692.54	1.95	-3735.57	8.17	-2812.28	12.33	-2855.31	2.14
10.	Jansath	11254.1	8.18	1361.23	2.98	-2388.09	10.47	7504.78	5.63
11.	Morana	8014.58	5.83	1854.01	4.05	-2264.75	9.93	3895.82	2.92
12.	Budhana	11613.64	8.45	2021.21	4.42	-466.95	2.04	9125.48	6.85
13.	Shahpur	7050.93	5.42	2028.78	4.44	-1473.50	6.46	3948.65	2.96
14.	Kandhala	8997.72	6.54	1832	4.02	-1664.74	7.29	5494.66	4.12
	Total(Distt.)	137425.46	100.00	1394.09	100.00	-22805.91	100.00	113225.46	100.00

Source : Statistical Handbook of Muzaffarnagar District. (1989)

surpluses, which is processed at defferent level of processing system. Out of total production about 93.4 lakh M.T. ready for processing. the blockwise analysis of sugar cane production revelas that Jansath block records the highest surpluses of 10.82 percent out of the total surplus of the area. it is followed by Khatauli (9.83). Morana (8.48). Purquazi (8.43). Charthawal (7.26). Kandhala (7.06). Baghara (6.99). Thanabhavan (6.86). Shahpur (6.37) and Muzaffarnagar (6.05) percent. The lowest surpluses of sugarcane (411391 M.T. or 4.40 percent) has been noted in Kairana block (Table - 4.6). The analysis of sugarcane surpluses reveals that whole or the area is more or less uniformaley rich in sugarcane surpluses except Jansath and Kairana where highest and lowest surpluses have been marked respectively. The infrastructural facilities like road etc.

TABLE - 4.6

BLOCKWISE SURPLUS OF CASH CROPS IN MUZAFFARNAGAR DISTRICT
(1989)

S.NO.	BLOCKS	SUGARCANE (M.T.)	%	POTATO (M.T.)	%	CASHCROP (M.T.)	%
1.	Muzaffarnagar	565493.04	6.05	6085.26	21.52	571578.30	6.10
2.	Bughara	652653.12	6.99	-984.11	3.48	651669.01	6.96
3.	Charthawal	678036.24	7.26	-127.72	0.45	677908.52	7.24
4.	Purquazi	787217.76	8.43	-1079.97	3.81	786131.79	8.39
5.	Kairana	411391.68	4.40	1214.43	4.29	4126066.11	4..40
6.	Shamli	544303.00	5.82	804.49	2.84	545107.49	5.82
7.	Thanabhavan	641155.20	6.86	3731.4	13.19	644886.60	6.89
8.	Un	556284.96	5.95	712.53	2.52	556997.49	5.95
9.	Khatauli	918713.10	9.83	823.07	2.91	919536.17	9.82
10.	Jansath	1010793.90	10.82	5893.8	20.84	1016687.70	10.89
11.	Morana	792576.96	8.48	4201.9	14.86	796778.86	8.51
12.	Budhana	522960.48	5.60	900.06	3.18	523860.54	5.59
13.	Shahpur	595407.12	6.37	1134.7	4.01	596541.82	6.37
14.	Kandhala	659912.4	7.06	-5581.48	2.05	659330.92	7.04
Total(District)		9336896.00	100.00	22728.3	100.00	9359624.3	100.00

Source : Stetistical Handbook of Muzaffarnagar District. (1989).

have no impact on sugar cane surplus as it is evident from the (figure - 4.4).

Potato:

Potato is an emerging cashcrop in the area. Its area and production changes at different level and production in Muzarfarnagar district is about 550.5 hundred M.T. after deducting the standard quantity of 16.4 per cent to the total production. It is, however, true to say that out of total production a sizeable share or the products is consumped by the local people as it is the main root crop of the area. Four blocks namely Baghara Charthawal, Purquazi and Kandhala shows deficiency in potato crop production as per their requirement. The highest surplus or potato has

been recorded at Muzaffarnagar block that is 21.52 percent followed by Jansath (20.84), Morana (19.86), Thanabhavan (13.19) and Kairana (4129 percent). The potato surplus forms two distinct zone. The highest surplus zone lies in the south-eastern section of the district and low surpluses zone froms North-West to South-Middle. While a belt of potato along south-west to North-East constitute deficiat zone. The search of modernization and urbanaization have influenced the production and surplus in the area.

CASH CROPS:

In cash crop surpluses, sugarcane is the dominant crop which is followed by potato. Therefore, the spatial distribution of cash crop is governed by sugarcane (Fig. 4.4) Total cashcrop surpluses are 94.6 lakh M.T. in the area in which the highest share is constituated by the Jansath block and the lowest by Kairana (Table - 4.6).

CHAPTER - V
PATTERNS OF INDUSTRIAL INFRASTRUCTURE

Infrastructure deals with the various kinds of facilities of any area. These infrastructural facilities are treated as indispensable instrument for areal development in integrated form. Since old time, there appear to be postive relationship between the availability or infrastructural base of any area and the level of development. However, infrastructural facilities influence the nature, degree and dimension of development. So, the availability of infrastructural facilities is considered as pre-requisite condtion for any kind of development, because in the absence of basic infrastructure, on development can take place.

Moreover, infrastructure comprises of certain basic facilities and in the absence of these the socio-economic enterprises can not become operative. An approach to factory by road, railway etc. for example is a pre-requisite condition for any plant to start functioning. Electricity line is another example. The nature of infrastructural facilities is required for functioning of any enterprise. If we want to industrialise any are, it should have a specific nature of infrastructural development of its kind. As well as any area develops its infrastructural base, preferability for being chosen a site for any industrial unit increases. It is important to note that many industries, which are not affected in their location by raw materials, get clustered in a certain limited area due to infrastructural development available

there.

Availability of infrastructural development is an economic factor for manufacturing units. If an industrial unit get located in any area where infrastructural facilities are rich, it would help to serve a lot of money for initial establishement. If a plant is located in an area having no infrastructural development large amount of money has to be spent on enterprise to become operative. Infrastructure is thus very important and effective factor in the localisation of industries. It is a working and key factor for any industrial development as well as agro-industrial development or any area.

Right from the begining, the world either developed or developing witnessed the paramount importance of infrastructure facilities. As we know that the developed world, termed as modern industrial world-even could not accelerate the pace of development without making substantial base of infrastructural facilities. The developing countries, where agriculture is the key occupation or majority or the population living in the villages, have proved that the level or development vary from time to time and from space to space fairly controlled by the availability of infrastructural lay-out. Therefore, the physical and social scientists have recognised the crucial role of infrastructure in developmental processes.

So, it can now be undoubtely accepted that either industrial or agricultural development may not be switched on in the absence of proper infrastructural facilities.

The study area, Muzaffarnagar District, lies in the uberous part of 'Upper Ganga - Yamuna Doab' where physical infrastructure in terms of fertile soil, slope,drainage, water and climatic conditions are highly suitable for the socio-economic setup. The Socio-economic attributes of the area have attracted the attention of policy makers and the resources users; which could might help the area to avail infrastructural facilities in order to harvest the rich resources of the area. Without emphasizing the ways and dimension of agricultural development in terms of quality and quantity, it can be said that area-under-study is rich in agricultural resources which are either being consumed or utilised by the rural people and the surpluses are supplied to internal and external markets. Obviously, present system of production and flow has been influencing the economy of the area in particular and the economy of the nation in general. The way of agricultural development accompanied by the promotion of infrastructure could only enhance the local interprenueral capacity, on the one hand and could atract outsiders to establish the industrial units in the district, on the other. Howeve , keeping these points in mind the study has been carried out to a evaluate the degree and nature of

infrastructural facilities required for agricultural as well as industrial development on which the economy of the region is based.

In developing countries like India, the industries mainly concentrate in and around the urban areas due to the existance or higher level of infrastructural facilities. There are clearcut regional trends of industrialization occuring along routes radiating from cities. This attraction of infrasturucture has resulted in nucleic and axial regional pattern of industrialization. The development of infrastructure, causes extensive changes in the different ways of developing the industries and other enterprises which ultimately transform the society as well.

In agricultural areas where vast land is under cultivation and therefore, infrastructural development is very sparsely distributed, it becomes an urgent need promote modern infrastructure required by agriculture and manufacturing. The role of transport routes is paramount because modern progressd depends upon the high degree of spatial linkages. British control over sea routes and advent of railways in Europe heralded industrialization in these parts of the earth. More recent example is of Egypt whose industrial production has shown substantial growth during fifties, especially close to the period when infrasturcture investment, mainly power transport, was begining to mature (

Alan, 1971)[1]. the concentration of industires in urban areas where infrastructure is more developed.

Indirectly but significantly infrastructure promotes developmental activities by bringing out certain fundamental changes. Expansion of transport system, for example, increases the ties of the countryside with the market and promotes the disintegration of the natural economy Tyanguancnko, (1973)[2]. Institutional and attitudinal changes in society bring about modernization.

MARKET :

Market is one of the important aspect of modern socio-economic infrastructure. From family level to national and international level, it has multifacious effects. It has been emphasised that economic activities do not merely link to the transportation system but is equally an important part of the process of marketing and market places where this penomena actually takes place. Our concern with markets is to see there as fixed points on earth's surface, their site and situation, measurement of extent of marketing activity and movement of commodties with reference to aeral limits of clientale. The marketing function takes place at specific centres distributed in an area with facilities of

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1. Mountjoy, Alan B., (1971) : ***Industrialization and Underdeveloped countries***. London, p.184.

2. Tynaguncnko, V.L. (Ed.), (1973) : *Industrialization of developing countries*, (Moscow).

collection and distribution of goods as well as availability of services. Market in economic parlance is the area within which the forces of demand and supply converge: geographically it is a well defined area or areas in human habitations varying from a petty village to a metropolitan centre. Market may be compared to organising with fixed functions, behavioural patterns, growth process depending upon the nature and extent of the region and their link in terms of transportantional network. As compared with the process of transportation, market ar marketing process are literally not as dynamic. In the total network, where the market centres are fixed points, the means and modes of transportation connecting the fixed points are mobile and more dynamic. In India, marketsprovide primarily as base for collection and subsequent distribution of various agricultural and industriaql products of the surrounding region. It is actually this function which links the markets with the countryside and as such the bulk of the market centres of India in general and of the region in particular have astrong rural base. They have originated largely as rural centres and subsequently assumed urban character by virtue of their nodality, function and services, local as well as central. As observed by Mukerjee, these small urban centres are 'urban' centres, their main function being collecting the agricultural produce from the entire region and distribution and directing and co-ordinating the sale of

imports and directing and co-ordinating the sale or imports and manufactured good. (Mukerjee. 1968)[3].

It is the ingenuity ora society. therefore. that determining the frontiers and absolute heights of development at a particular point or time. orten expressed as the material advacement. However. within these sweeping realities effective demand varies at different time scales for such factor as commercial production of commodities/services arter their invention. their knowledge and availibility is made possible by communications and transportation and most important of all. the will and power to purchase them. Market. obvious l . assumes crucial role in agriculture and industrialization and market research is strategically important for planned development. It is also observed that industrial development revolves round the potential market (Alan. 1966)[4]. which is the function of the product of qualitative and quantitative level of things urged for the moreover. the numbers of persons having will and capacity to purchase those things.

Spatial Distribution Of Markets In Muzaffarnagar District :

In this study only the urban centres identified by census of India 1981 have been taken into account including

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3. Mukerjee. R.K. . (1968) : ***Man and Habitation,*** Bombay. p.122.

4. Mountjoy. A.B.. Op. Cit. p.92.

two recently identified urban centres namely Alam in Kandhala and Barat in Shamli Block. The total number of towns in the district has become twenty. These towns are playing vital role in marketing system besides rutal marketing centres/rural service centres and periodic markets. But infact the towns of the district are rearing up the entire marketing duties within their respective areas. These market centres perform wholesale, retail of agro-commodities marketing. Moreover, the market centres are providing the opportunities of exchanging material, man, knowledge culture and way of life with varying dimension.

Blockwise analysis of market centres indicate that Un block has three market centres followed by Shamli, Kandhala, Thanabhavan, Jansath and Shahpur having 2 market centres each. The remaining blocks have one urban centre excluding Baghara block which have no market centre and it depends on its surrounding market centres (Appendix 5.1).

TABLE - 5.1

Grades Of Market Centres Of Muzaffarnagar District

S.NO.	Size of markets based on population	Grade of markets	No. of markets grade	Percentage to the total
1.	Above 1,00,000	I	1	5.00
2.	50,000-1,00,000	II	1	5.00
3.	20,000-50,000	III	3	15.00
4.	10,000-20,000	IV	11	55.00
5.	Less than 10,000	V	4	20.00

Source : Statistical Handbook of Muzaffarnagar District, (1989)

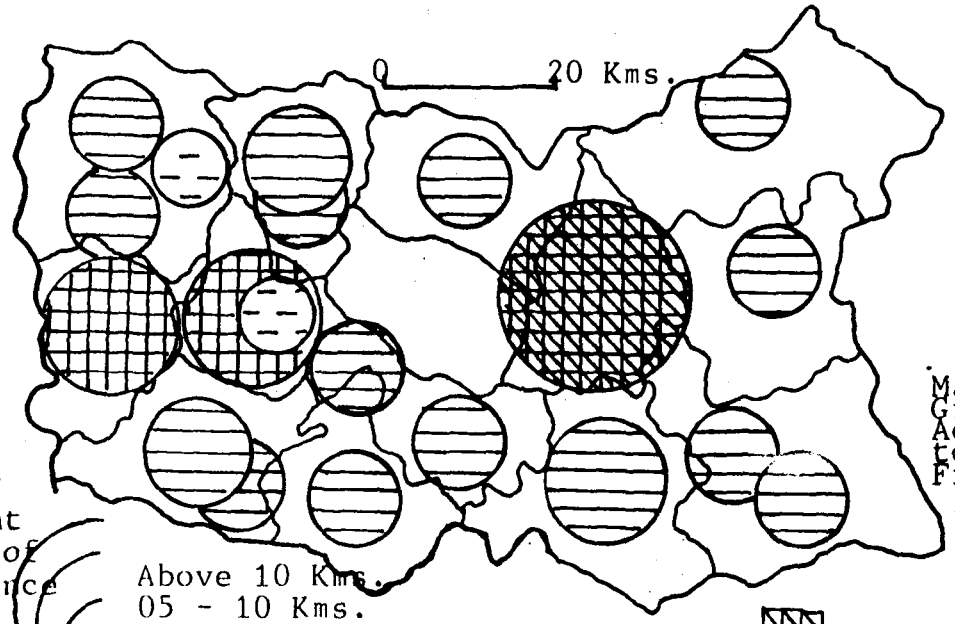
All market centres have been grouped into five grades taking population as a basic criteria. The market centre registering the population more than 1,00,000 is Muzaffarnagar and between 50,000 to 1,00,000 is Shamli. Third grade of markets including Kairana, Khatauli and Kandhala have a population range of 20,000 to 50,000. The maximum market centres (eleven) fall in the fourth grade ranging between 10,000 to 20,000 population. Alam, Shahpur, Garhipukta, and Banat towns come in the fifth grade registering a population of less than ten thousands (Table 5.1 and Fig. 5.1).

Classification of Market On the Basis Of Their Extent Of Service Areas::

A market can not function in isolation. The origin and growth of a market depends on the commodity surplus of the countryside. If we select a single market on a small island of a few square miles, we might expect the entire island to be a trading area. Such 'closed' trading areas are not frequently found. It is believed that a market influences its surrounding areas representing the people like a magnet attracting iron fillings. The magnetic field or range of influence, therefore, may well be determined on the basis of market potential on the one hand, and number of persons in the area on the other hand. The process of gravitation is completed by transportation net-work, and

MUZAFFARNAGAR DISTRICT

MARKET AND THEIR FIELD OF INFLUENCE



SIZE OF MARKET BASED ON POPULATION

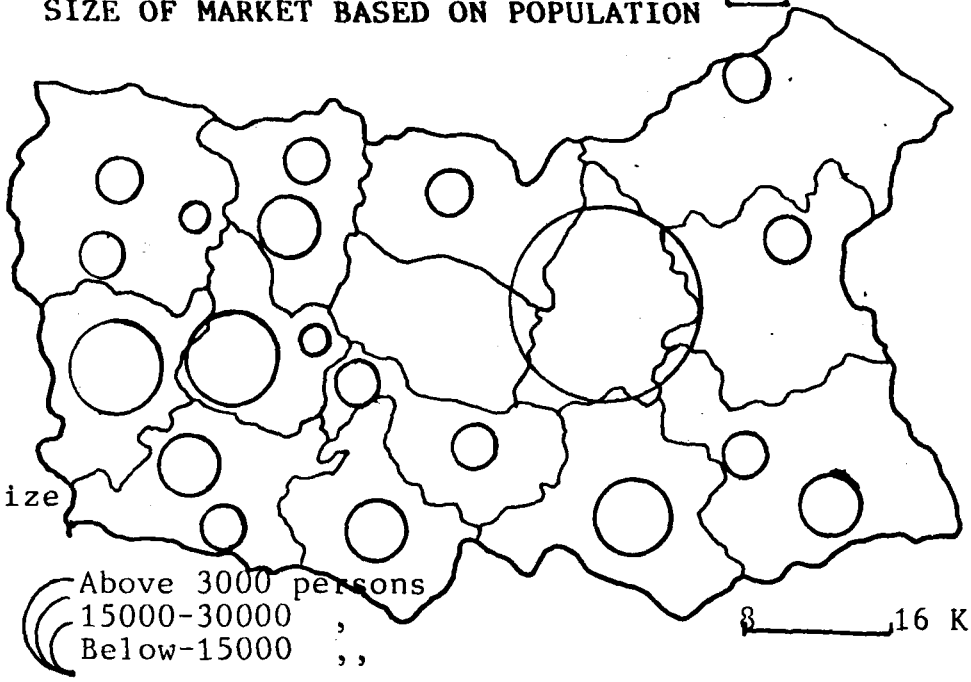


FIG. 5.1

therefore, direction and nature of transportation too effects the area of influence surrounding the market.

The degree or extent of influence is proportional to the total area of the region and the total population of the market on the one hand and the total population of the area on the other. This relationship may be expressed by the following simple equation :

Radius of the market influence =

$$\sqrt{\frac{\text{Total area of the region} \times \text{Total population of the market}}{\text{Total population of the area.}}}$$

Assuming the area of influence to be circular, the radius of the circle will measure the extent of influence. The larger the circle, the greater will be the extent of influence.

The following four grades of markets may be recognised on the basis of their fields of influence. It is very interesting to note that the four grades determined by population also coincide to a large extent with transportation network (Fig. 5.1).

First Order Centres :

In Muzaffarnagar district, Muzaffarnagar city is the only market centre having the largest degree of

influence and as such may be described as a 'regional market centre'. Although its immediate field or influence as determined by the radius of the circle is only 17.75 Kilo meters (Table- 5.2), it actually serves the entire region by virtue of its transportational, industrial and commercial importance. Muzaffarnagar city is the largest trading centre of the

TABLE - 5.2

Market Grades According Their Field Of Influence In Muzaffarnagar District :

Grades	Field of Influence (K.M.)	Total Number
I	above 12	1
II	8 - 12	2
III	4 - 8	15
IV	Below 4	

Source :Statistical Handbook Of Muzaffarnagar District.

area distributing commodities/services throughout the region through a hierarchy of market places from various size of towns, semi-urban places and rural service centres to the bottom level of village - shopping centres. Its field of influence becomes wide enough because of its 'nodal' situation in terms of transport newtwork.

Second Order Centres :

Shamli and Kairana are the two markets, which fall within the second order with 9.75 and 9.04 km. as the extent of their field of influence respectively. These centres function as collecting and distributing centres for their surrounding areas, and as such, have become gradually the active market for retail business for the people of their surrounding countryside.

Third Order Centres :

15 market Centres have their field of influence ranging between 4 and 8 km. The development of these market centres is highly governed by the nature of agro-commodites as the sugar is the chief product of the area and being processed at villages, making especially raw sugar, is supplied to the nearest market centres. Consequently 5 market centres mainly Kandhala, Khatauli, Thanabhavan, Purquazi and Shahpur have developed chief Gur-mandies in the area.

Fourth Order Centres :

Only two market centres are included in the fourth grade. These markets are simple in their goods structure and marketing milieu and generally have a single, mostly linear pattern with the typical Indian 'bazzar' with a few wholesale shops of grains and some retail shops and other mixed commodities. They are served by transport facilities

of various grades ranging from metalled roads to cart tracks.

Except field of influence of Muzaffarnagar and Shamli towns, whose lower order influence places are not only large in number but specially well distributed. Northern, Southern and Western parts of Muzaffarnagar's influence are following the main routes have larger number of central places (Fig. 5.1).

Except these 20 urban towns/market centres there are total 51 periodic markets. Periodicity is an essential element of local indigeneous market structure of most under-developed countries as it was of Medival Europe (Hodder, 1965)[5]. This is equally true for a developing country like India with a strong rural base with a large number of rural markets with periodicity as one of the characteristics. In a country like India, the good and services of a permanenet market are not available to the rural consumers. A periodic market never (sells) to a rich person and a metropolis hardly caters for a large number of the poor villagers directly. These institutions provide the mechanisum for satisfying the limited demands for goods and services of the masses of rural consumers with self-dependent economy. The market functions are performed by mobile agents moving from place to place during a short run

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5. Hodder, B.W., (1965) : ***Distribution of markets in Yorubaland - Scottis***, Geographical Magazine, Vole. 81, No.1, April, p.48.

of time. Such spatial behaviour of individual or aggregate suppliers gives rise to the weekly markets or the fair (Garner, 1967)[6].

Block analysis of periodic markets reveals that Jansath block has the largest number (12) of periodic markets in the district followed by Morana, Purquazi, Khatauli and Thanabhawan having 10,7,6 and 4 respectively. Remaining blocks excluding Muzaffarnagar and Kairana have one, two or three numbers of periodic markets. It is interesting to note that the eastern part of the district, dividing through Khatauli Muzaffarnagar and Purquazi, G.T. road have the largest number of periodic markets (35 out of 51).

Thus it is clear from the above analysis that the market centres of the area are ecologically adjusting and performing their function in a wanted manner besides the general irregulations found in the marketing centre of the nation.

CAPITAL :

Capital in the widest sense of the term is manmade productive capacity and may exist in monetary, physical and abstract (eg. education and training of a man) form. Though capital is very wide term and it is not easy to formulate a

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6. Garner, B.J., (1967) : ***Models of Urban Geography and Settlement Location*** in Models in Geography' edited by Chorley, R.J., and Haggett, P. Methuen, p.320.

simple but absolutely accurate definition of capital, yet it may be treated as man made productive capacity which performs its function in monetary, physical and abstract forms. Hence, the capital in terms or money especially bank money has been taken into account. Money has been defined in various ways, some treated it as a medium or exchanges. However, the above applied terms does not bring out the fundamental character ot money/capital, because by virtue, a commodity can not be called money as a commodity in form of a means of exchange serve itself in order to become money.

Spatial Patterns Of Financing Institutions:

There are 143 nationalised banks in the district out of which 77 are in rural areas and the remaining 66 are lying in urban areas. Muzaffarnagar block register the highest number of nationalised banks that is 29 followed by 4 non-nationalised, 4 co-coperative banks, 3 regional rural banks and 16 others which are loaning for land development (Table 5.3). It is interesting that out of 25 regional rural bank 24 are located in rural areas. The distribution of banks in rural areas of the district is as follows :

Muzaffarnagar block 10, Morana 10, Khatauli, Jansath and Baghara each 9, Purquazi and Kandhala each 8, Charthawal 7, Shamli 6, Budhana, Shahpur Thananbhavan, and Un each 5. There are only 7 of which 64 percent money has

TABLE - 5.3

TABLE - 5.3

Number of Nationalised. Non-nat onalised. Rural Banks. Sahakari Banks. Land Development Banks in the District on (URBAN SECTOR)

S.NO.	NAME OF THE TOWN	NAME OF BLOCK	NO.OF BRANCHES OF NATIO-NALIZED BANK	NON-NATIONALISED BANKS	RURAL BANKS	CO-OPERATIVE BANKS	LAND DEVELOPMENT BANKS
1.	M Z N	M Z N	21	4	1	4	16
2.	Charthawal	Charthawal	2	-	-	1	1
3.	Purquazi	Purquazi	1	-	-	1	1
4.	Kairana	Kairana	2	-	-	1	1
5.	Shamli	Shamli	11	-	-	2	6
6.	Banat	Banat	1	-	-	-	1
7.	Jalalabad	Thanabhavan	1	-	-	-	1
8.	Thanabhavan	Thanabhavan	2	-	-	1	1
9.	Un	Thanabhavan	1	-	-	1	1
10.	Ghinghana	Un	1	-	-	-	1
11.	Garhi Pukta	Un	1	-	-	-	1
12.	Khatauli	Khatauli	7	1	-	1	2
13.	Jansath	Jansath	5	-	-	1	2
14.	Mirapur	Jansath	-	-	-	1	1
15.	Bhokarhavi	Morana	1	-	-	-	1
16.	Budhana	Budhana	3	-	-	1	2
17.	Shahpur	Shahpur	2	-	-	1	1
18.	Sisoli	Shahpur	1	-	-	-	1
19.	Kandhala	Kandhala	2	-	-	1	2
20.	Alam	Kandhala	1	-	-	-	1
	TOTAL		66	5	1	17	44

Source : Statistical Hand book of Muzaffarnage District. 1989.

been resulted for agricultural development purposes. while the remaining 36 percent devoted to small industries and other activities per agricultural had 413 rupees hasbeen paid whereas the percapits loan in gross term is about to 644 rupees (1988).

TRANSPORT AND COMMUNICATIONS :

Transport. the most important single item or

TABLE - 5.4

Blockwise Distribution of Commercial Banksin the District (Rural Sector) 1988 - 89.

S.NO.	Development Blocks	No.of Nationalised Banks	Regional Rural Banks	Other Non-nationalised Commercial Banks
1.	Muzaffarnagar	8	2	-
2.	Baghara	8	1	-
3.	Charthawal	6	1	-
4.	Purquazi	8	-	-
5.	Kairana	2	2	-
6.	Shamli	4	2	-
7.	Thanabhawan	4	1	-
8.	Un	4	1	-
9.	Khatauli	4	5	-
10.	Jangath	7	2	-
11.	Morana	8	2	-
12	Budhana	3	2	-
13.	Shahpur	4	1	-
14.	Kandhala	7	1	-
Total-Rural	Rural	77	24	-
Total-Urban	Urban	66	1	5
Total(District)		143	25	5

Source : Statistical Hand book of Muzaffarnager District. 1989.

infrastructure. is essential for all kinds or economic development and indispensable for industrialization. It is very important infrastrucure which acceleratres the pace of development. In the absence of transport facilities the general economic backwardness is apparant because natural resources can not be utilized and industries can not be started.

Well connection with the transport network is

necessary for a manufacturing plant to be perfectly operative. Modern industrial production requres the movement. not only of the material in process. but also of the people. equipment. auxiliary materials. information and energy involved in its operation (Wagner. 1960)[8]. Such nature or a manufacturing plant makes its spatial relationship very important without which a factory can not. infact. live at all. Transport is such an important infrastructure for industry that in all considerations since Weber's ideas on plant location. transport has remained the most decisive factor (Smith. 1971)[9]. It is the cheap. modern and efficient transport whose availability makes development of industrialization possible (Clark. 1967)[10] as Japan holding as giant economic power in the world without having huge raw materials resources and market as well (Kolb. 1971)[11].

Transport and communications systems are manifestation of human endeavour. The lines of transportation have a force for thier existence behind them. and. that force is neither associated with terrain factor

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8. Wagner. P.. (1960) : ***The Human use of the Earth.*** Illinoise. p.207.

9. Smith. D.M.. (1971): ***Industrial Location.*** John Wiley & Sons. New York. p.69.

10. Clark. Colin. (1967):***Population growth and Land use.*** (London). p.285

11. Kolb.A..(1971): ***East Asia: Geography of Cultural Region.*** Methuan & Co.. London. pp. 484-522.

nor climate, but, to a large extent, is guided by economic demands of the area in terms of goods or commodites awaiting movement. Appleton (1960)[12] remarks that the lines of communications like any other element in the landscape invariably reflect in their shape, arrangement and pattern, the purpose for which they were made: with the change in economic conditions, transport pattern also changes its form and function. Moreover, as a society becomes more complex, its transport and communication networks also become complex. These networks then keep complex space economy functioning and its any distruption has paralytic effect (Lowe, 1975)[13]. Now their significance as the formative economic power of growth and differentiating process (Voight, 1967)[14] of areas in general and as an essential element in the growing infrastructure upon which the expanding economies of the less developed countries must be based is well accepted (Hoyle, 1973)[15]. Transport difficulties are understood to have retarded exploitation of natural resoures, industrialization, expansion of trade and

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12. Appleton, J.H., (1960): ***The Geography of Communication in Great Britain,*** London, p.112.

13. Lowe, John C. and Morvadas, (1975): ***The Geography of Movement*** (Boston) p.5.

14. Voight, F., (1967) : ***The Importance of the Transport System for Economic Development Process*** (Un Econ. Comm. for Africa, Addis Ababa,).

15. Hoyle, B.S., (1973): ***Transport and Economic Growth in Developing Countries;*** The case of East Africa in Hoyle B.S. (Ed.), Transport and Development (London), p.50.

in some cases the achievement of national unity (U.N. Econ. and Soc. 1962)[16]. A balanced development of transport and communication network, in keeping with the requirements for developing an economy in a particular set of time and space, is vitally important. It is this role of transport and communications, in which not only magnitude of transport development counts but amply scope of human selection choosing wisely the spatial frame of the transport and remains, that sets the role for geographic thinking in communications network.

Transport - the ***de facto*** parameter of economic, social and commercial progress has transformed the entire would into one organised units. Economic and comercial importance of the greatest magnitude is, now-a-days attached to the development of transport. The transport industries which undertake nothing more than the more movement of persons and things from one place to another, have constituted one of the most important activities of men in every stage of advanced civilization (Marshall, 1921)[17]. In fact, the whole structure of industry and commerce rests on the well laid foundations of transport (Fenelon, 1925)[18].

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16. U.N. Econ. and Soc., (1962) :***Council Transport, Development*** (New York).

17. Marshall, Alfred ,(1921): ***Industry and Trade,*** p.423.

18. Fenelon, K.G., (1925): ***The Economics of Road Transport*** p. 10.

Those days are now dead and gone when small communities inhabiting distant tracts of land were economically self-sufficient producing all the vast range of goods. In the modern age of specialization such a self sufficient society is inconceivable. How, people reap the advantage of the territorial division of labour and the operation of the theory of international trade. thus, nations depend upon one another for the supply of raw materials and finished products. For the maximisation of human satisfaction it is imperative that the scarce resource which have alternate uses have a constant flow which is abstructed of different countries (Robbins 1955)[19]. It is transport which helps human beings in removing this unwarranted barrier of physical separation and enables a given flow of resouces to produce greater results (Bonavia. 1954)[20].

It is therefore. abundantly clear that effective transport is indispensiable for the economic progress of the country. Manufacturing merchandising. banking. extracting and the like businesses all depend upon transport activity. As Mr. Callender has observed that historians have generally failed to appreciate the importance of this factor in American development much more attention has been paid to

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19. Robbins . Lional.. (1955): ***An Essay on the Nature and Significance of Economic Science,*** p. 1.

20. Bonavia. M.R..(1954): ***The Economic of Transport,*** p. 3.

the growth of manufacture, to cureneez and the banking systems but none of those matter has exerted the tithe of the influence upon our economic growth that has come from improvements in transportation[21].

Now-a-days, the entire economic life of the people of a country depends upon transport services from the production and collections of raw material and distribution finished produc..s is the main cost bearing activity in industries.and thus, it effects consumption to an appreciable extent (Ghose, 1945)[22]. An improvement in the technique of modern transport has considerably increased the wealth of the society through the development of trade and commerce.In India, the most important factor which contributed to the initial concentration of cotton extile industry at Bombay was the availability of excellent transport facilities both in regard to raw material and consumers' market (Mehta, 1958)[23].

It must be remembered that the high rates of transport restrict the market for a commodity. The most obvious effect of improved transportationis to make

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21. Callender, G.S., (1909) : Selection from the Economic History of the United State, p.345.

22. Ghose, B.C., (1945) : Industrial Location, Oxford Pamphelet on Indian Affairs, No. 32, London, p.8.

23. Mehta, M.M., (1958) : Location of Industries p.30: and T.R. Sharma -Locations of Industries in India (1958), p.17.

available to a community the goods which must. of necessity be produced elsewhere. A community without cheap transportation must be largely self-sufficient climatic conditions and available natural resources limit the goods whichmay be produced. and only those products from other lands can be brought in. which will stand high transportation cost. Cheap transportation permits other goods to be brought in. so that the products of other lands and climax may become as common place as the articles produced at home(Locklin. 1947)[24].

Transpor exercise its profound influence on wants. mode of consumption and the quantity of consumable goods also. Owing the reduced cost of transport. the cost of production also scales down-thus reducint the selling price which enable consumers to enjoy those commodities indiverse variaties which are not produced in their countries. Of late the dominant factor in the Englishman's increased capacity to obtain in almost every important commodity is one and the same - nam· 'y improved transport. fora main part of what improvements. now accomplish is to cheaper transport (Pigou. 1957)[25].

Transport makes places accessible. Accessible places are preferred places for the locationof manufacturing

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24. Locklin. D.P..(1947) : ***Economics of Transportation***. p.p. 1-2

25. Pigon. A.C.. (1957) : ***Economics of welfare***, p.74

industry. In agricultural areas where vast areas are inaccessible, places of accessible are few and have special importance for the location of industry. Cities and routes radiating from them make the most preferable places for industrialization. In large areas, therefore, the spatial patterns are precisely explained by the road and city patterns. Transport also help industrialization in rural areas in a different way. Rural areas well linked by road to nearby towns and cities undergo social and economic transformation and linkely areas of entrepreneurship. Such rural areas have higher levels of economic development as well as higher level of potential development.

It is at nodes and along traffic flow-lines that viable industrialization may occur. initial location pattern of industrialization therefore, generally develops as 'strip-linked-stars' being the modes and strips the trunk routes joining them. However, as routes also develop for many other kinds of interactions other than manufacturing, their effective role comes into play only when an agricultural are is prepared for development of manufacturing by surplus and specialized crop production.

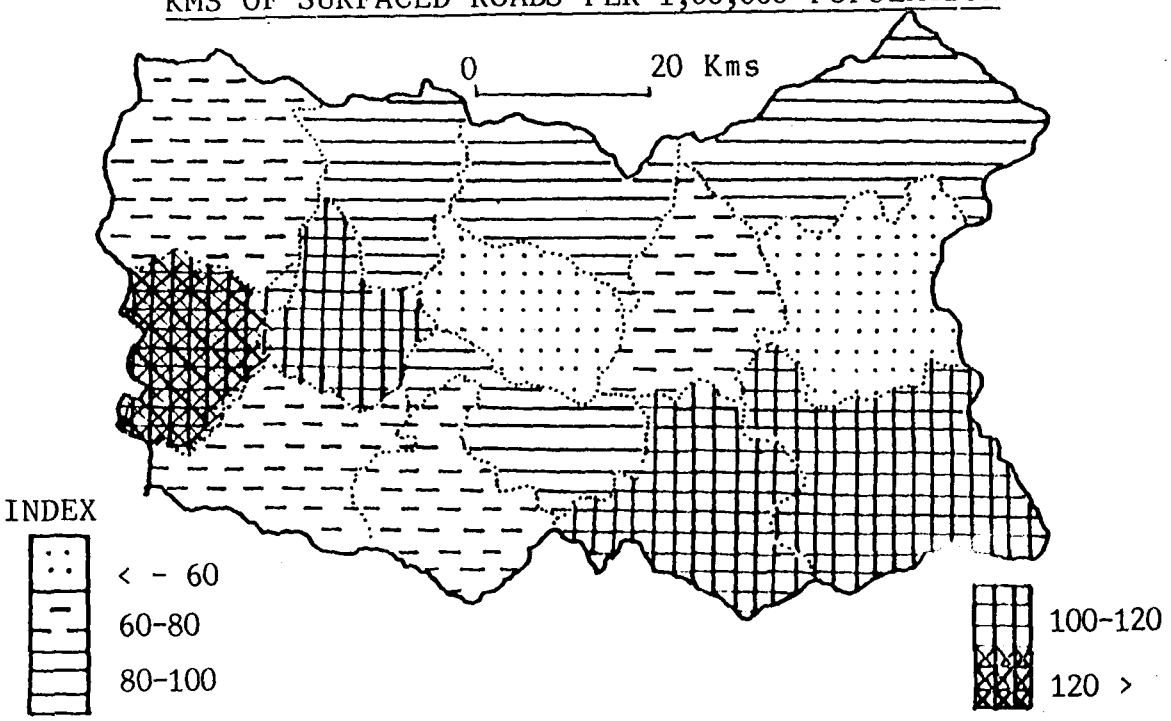
The Transport N.twork in Muzaffarnagar District :

The main transport routes in the area tend to radiate from the national capital and are shaped by the north-south flows of the rivers directing them in the same

MUZAFFARNAGAR DISTRICT

DENSITY OF SURFACED ROADS, 1989

KMS OF SURFACED ROADS PER 1,00,000 POPULATION



KMS. OF SURFACED ROADS PER 1,000 KM^2

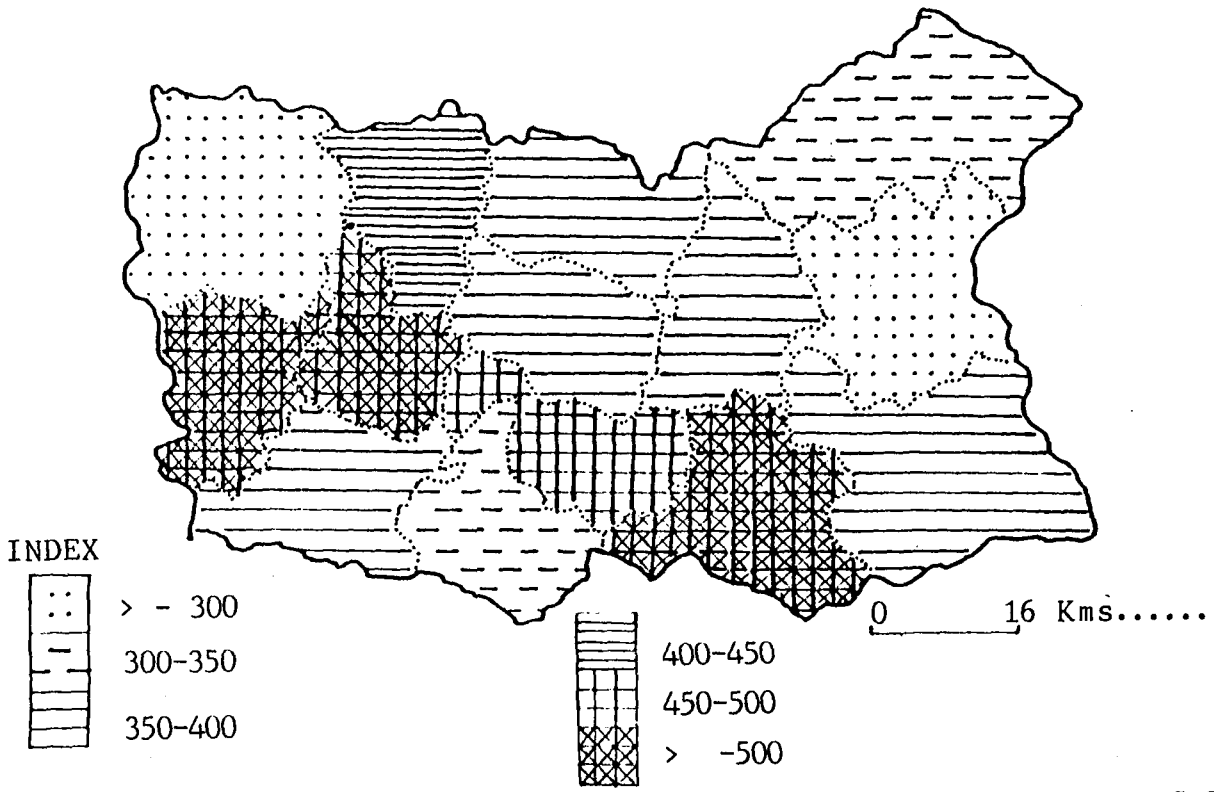


FIG. 5.3

direction. The oldest and trunk traffic-flow-line consisting of a broad guage railway line and a trunk road running closely parallel runs from Delhi to Muzaffarnagar and beyond towards north (Fig. 5.2). Meerut city (population 1981: 538461) in the south and Saharanpur (294391. 1981) in the north which is a node at east-west flow line thus shaped by the Himalayas and where the north-sourth flow-line changes direction. are two gateways linking the study area to the rest of the country. Meerut-Muzaffarnagar are thus linked by the trunk route consisting both of a railway line and a road. From about 8 km north of Muzaffarnagar the trunk road and the railway line diverge apart. Having asumed significance recently is another north-south rail and road running from Delhi to Saharanpur via Shamli. The two trunk routes are the part of the transport network system of the largest region and the country to which the area is linked. Besides, relatively weeker and more recent links by road are to the east via recently built Ganga Barrage (the head of the Midle Ganga Canal) and to the west into Harvana state via Yamuna Bridge between Kairana and Panipat. In relation to this broader frame of transport network the intra district transport system may evaluated.

The total length of routes in the area comprises of 74 kilometers of broadguage lines in two separate sections with 15 railway station of varying significance.

1808 kilometers mattaled roads out of which 1148 kilometers have been constructed by Public works Department includes national high ways, provincial highway and districts roads rollowed by 325 kilometre lengthy road constructed by local bodies such as Zila Prisad, Municipal Corporation, town area community and notified.

TABLE 5.5

ROAD AND RAIL ROAD LENGTH IN MUZAFFARNAGAR DISTRICT

Year	Railroads	Surfaced Roads	Unsurfaced Roads	Total Roads
1901[a]	46	125	514	639
1947[b]	94	166	532	698
1981[c]	94	830	620	1450
1989[d]	94	-	-	-

Source : a Imperial Gazatteer of India, Vol. XVIII. p. 90

b Computation from District's map-53-Saharanpur Sheet. 5th edition. 1947.

c SPMJ (1982)

d SPMJ (1989)

area community. Their are some departmental roads as of irrigation department (71 km) and sugarcane society (280 km).

There is a gradual increase in the length of the roads. In 1901 there were 639 km. in 1947-6.98 km in 1981-1450 km and in 1988-1998 km (Table-5.5). Out of the total road network 1502 km is rural and the remaining 306 km lies in urban areas.

Khatauli block records the highest length of roads (168 km) followed by Jansath 15.5 km. Shamli 138 km. Kairana

125 km and Kanthala 102 km. The minimum length of road 68 km has been noted in Morana block. The road length of the district Muzaffarnagar is governed by physical factors particularly by terrain. It is interesting to note that there is a highly uneven distribution of roads in urban and rural areas (Fig. 5.3).

Density of roads, (per thousand km^2) in rural areas focus only 364.9 roads as against of 5160.2 km in urban areas. Moreover, the rural road average is quite less than the district average of 433.0 km. Area wise density of roads at block level is the highest in Shamli block (68.35 km per. 000 km^2) followed by Khatauli 539. Kairana 538. Shahpur 475 and Thanabhavan 423 km. Again Morana block has the minimum length of roads that is 181 km at per thousand km^2. (Table 5.6). The length of roads availability has also been analysed at population level treating one Lakh persons as unit. District average is about 80 km whereas in urban areas it is 60 km and in rural areas it is about 85 km. Blockwise length of metalled roads at 1 Lakh population is the maximum in Kairana block (137.1 km) followed by Shamli 117.1. Jansath 109.3 and Khatauli 1002. km. Morana block register the minimum length of roads 53.3 km on per lakh of population (Table-5.6). The analysis of roads in the district shows spatial variation in the concentration of roads, the impact of which is clear on the development

TABLE - 5.6

BLOCKWISE DENSITY OF METALLED ROADS-IN THE DISTRICT. 1989.

S.NO.	BLOCKS	Length of Roads constructed by P.W.D. (K.M.)	Total Length of Metalled Road (K.M.)	Per 1.000 Km^2 (K.M.)	Per 1.00.000 Population (K.M.)
1.	Muzaffarnagar	91	97	399.7	67.9
2.	Baghara	66	83	360.7	58.1
3.	Charthawal	69	103	390.1	92.1
4.	Purquazi	80	102	343.9	84.6
5.	Kairana	99	125	538.6	137.1
6.	Shamli	91	138	68.35	117.1
7.	Thanabhavan	77	105	401.2	92.8
8.	Un	66	88	221.9	69.8
9.	Khatauli	105	168	539.0	100.2
10.	Jansath	122	155	345.6	109.3
11.	Morana	59	68	181.9	53.3
12.	Budhana	64	78	322.7	66.7
13.	Shahpur	66	90	475.4	80.0
14.	Kandhala	69	102	353.4	74.1
	Total Rural	1124	1502	364.9	84.8
	Total Urban	24	306	5160.2	607
	Total(District)	1148	1808	433.0	79.5

Source :- Statistical Hann Book of District. Muzaffrnager. 1989.

indices of the district at block level (Fig-5.3).

With the variation on the length of roads at block level there is a variation at traffic-flow level also between places to place. In this view Meerut-Muzaffarnagar-Roorkee rail road and road is the busiest routes of the district following Baraut-Shamli-Saharanpur railroad and road. Muzaff rnagar-Shamli and Muzaffarnagar-Bijnor roads appear to be functionally more significant. This is due to the intensity of interaction between the roads. The three main routes mainly meerut Muzaffarnagar-Sahanranpur route.

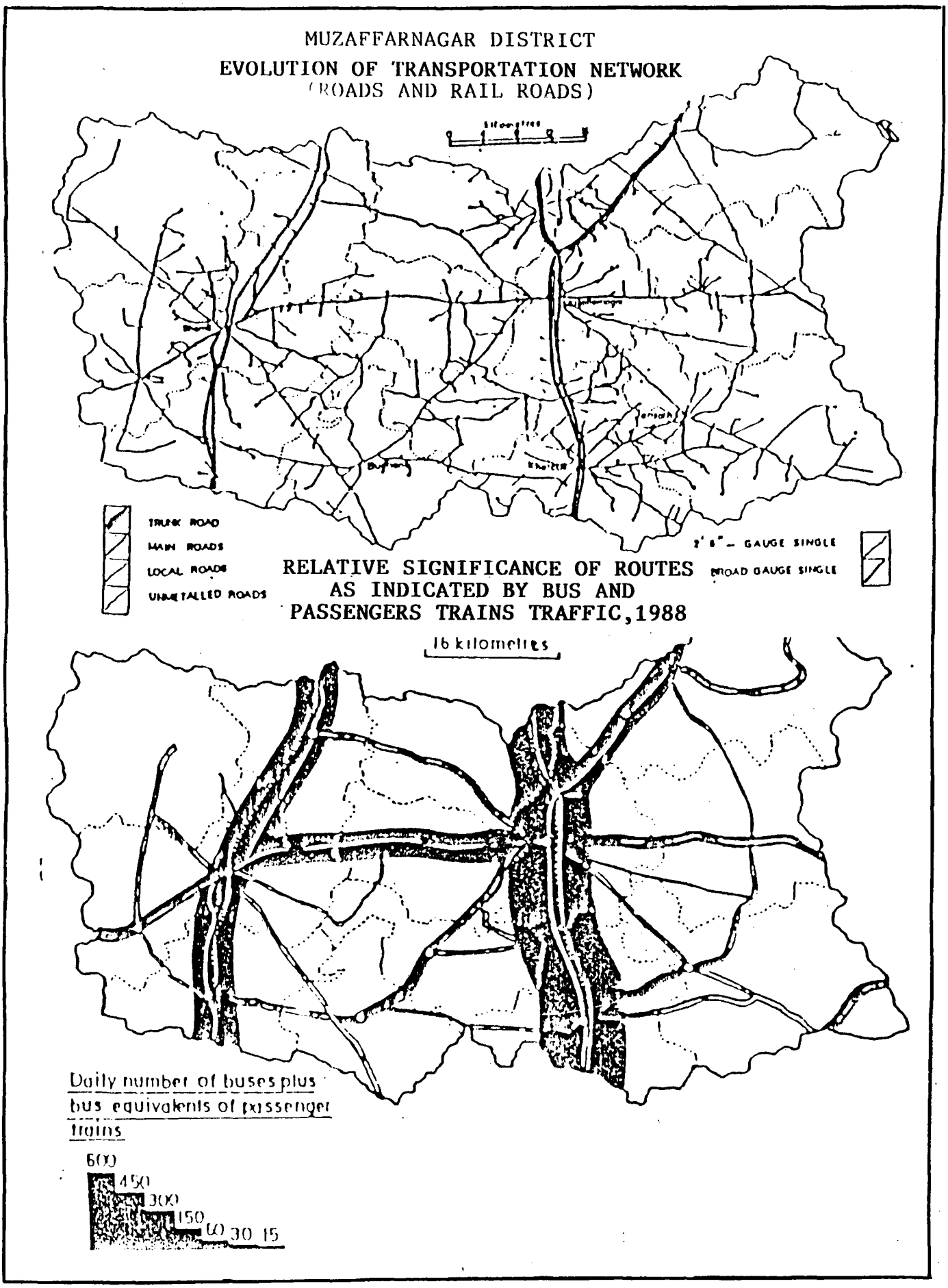

MUZAFFARNAGAR DISTRICT
EVOLUTION OF TRANSPORTATION NETWORK
(ROADS AND RAIL ROADS)
TRUNK ROAD
MAIN ROADS
LOCAL ROADS
UNMETALLED ROADS
2' 6" — GAUGE SINGLE
BROAD GAUGE SINGLE
RELATIVE SIGNIFICANCE OF ROUTES
AS INDICATED BY BUS AND
PASSENGERS TRAINS TRAFFIC,1988
16 kilometres
Daily number of buses plus
bus equivalents of passenger
trains
600
450
300
150
60 30 15

FIG. 5.2

Kandhala-Shamli-Thanabhavan-Saharanpur route and Muzaffarnagar-Shamli route cobindly make a unique structure shaped like H alphabate of English in the area (Fig-5.2). The traffic-flow pattern distinguished some transport lines having high connectivity on a generally unapproachable land. It shows the reltion operational significance of available routes. a factor that counts in location-decisions of factory and determination of industrialized areas. Riverside areas are showing poor accessability as compared to the other part of the district. The main transport line radiates from north to south parallel to the chief train line. However, without emphasizing the role of transport system the road network in the district has left the great impact on the level or areal development which can observed by travelling the area from either side.

LOCATIONAL ANALYSIS OF BASIC INFRASTRUCTURAL AMENITIES:

The post-office, telegraph-office, telephone, railway station, bus-stop, banks, market have been taken as indispensable infrastructural amenities necessary for development. It is needless to deviate from the fact that the moto of development is to serve the people at least distance. Therefore, it has been analysed that what is the locational distribution of infrastructural amenities.

In district, Muzaffarnagar only 16 percent of the total villages receive the above mentioned facilities at

TABLE - 5.7

BLOCK WISE DISTRIBUTION OF BASIC INFRASTRUCTURAL AMENITIES AMONG THE VILLEGES IN DISTRICT. MUZAFFARNAGER

(Precentages of villages classified into three groups receiving the basic infrastructural amenities. < 1 Km.. 1-3 Km.. >3 Km.).

S.NO.	NAME	<1	1 - 3	>3
1.	M Z N	22.39	9.42	68.35
2.	Baghara	35.81	15.45	63.45
3.	Charthwal	12.80	14.04	73.14
4.	Puroazi	8.52	17.45	74.09
5.	Kairana	16.63	14.70	68.66
6.	Shamli	21.07	17.97	60.95
7.	Thanabhavan	16.61	17.39	66.14
8.	Un	12.87	6.57	81.45
9.	Khatavli	16.02	14.40	69.57
10.	Jansath	14.47	14.47	73.65
11.	Morana	20.80	10.16	68.87
12.	Budhana	18.80	10.83	70.10
13.	Shahpur	26.83	12.77	60.38
14.	Kandhla	18.36	11.76	69.87
	District	16.44	13.44	70.37

Source : Stetistical Handbook of Muzaffarnagar District (1989).

village level. 13 percent village population travel upto less than 3 km to get the desired facilities. It is a noticeable point that 70 percent villagers have to go more than 3 km to get the amenities of road. postoffice. bank. and market (Table-5.7). Shahpur and Baghare are the only bloick where one-tourth settlements register these amenities at their villages level. Purquazi shows the poor structure or amenities at village level where about 74 percent villages receives these basic amenities by travelling more than three kilometers. Un block records 81.5 percent villages from where these amenities lie at more than 3 km. there is an uneven distribution of the amenities in villages and are obviously not reaping the fruits of these facilities

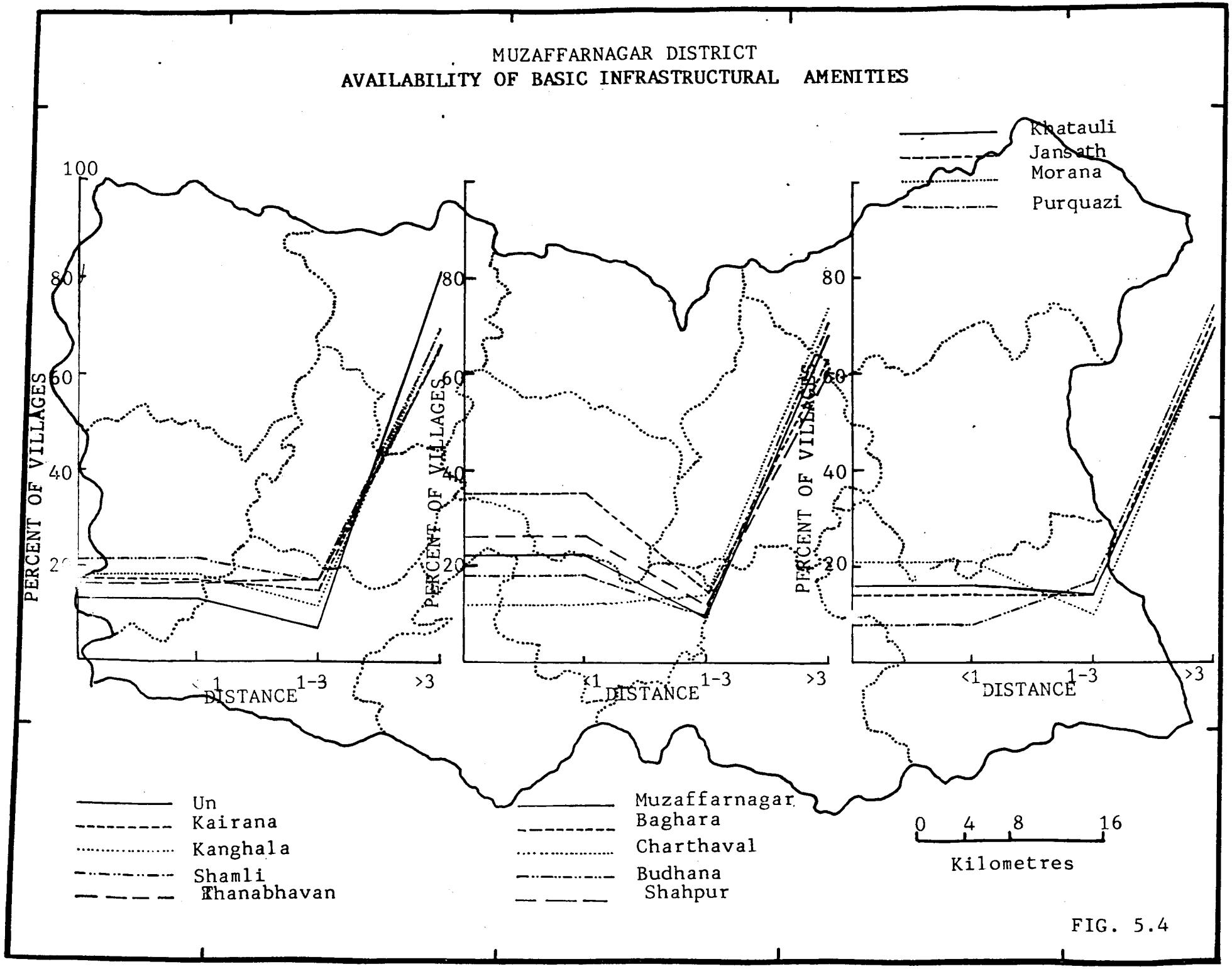

MUZAFFARNAGAR DISTRICT
AVAILABILITY OF BASIC INFRASTRUCTURAL AMENITIES
PERCENT OF VILLAGES
100
80
60
40
20
DISTANCE
<1
1-3
>3
Khatauli
Jansath
Morana
Purquazi
Un
Kairana
Kanghala
Shamli
Thanabhavan
Muzaffarnagar
Baghara
Charthaval
Budhana
Shahpur
0 4 8 16
Kilometres

FIG. 5.4

at village level, which is indeed a basic herdom in the socio-economic development of the area (Fig-5.4).

ELECTRICITY:

Electricity in modern era is the chief source of energy and plays a vital role in the development of agriculture and industries. Just like transport route the electric lines also make an area dynamic and constructive. In agricultural areas, mainly in plains, there are very little opportunities of hydroelectricity generation. In the absence of coal-mines and petroliumwells, in such areas, the electricity power supply is deemed to be one cheapest and durable means of energy. In the present area Nirgazani and Chitaura falls out of a total of 13 such falls are 2 to 5 meters on upper Ganga Canal generating hydro-electricity. Besides this generation, the only energy produced in the district is the bio-gas produced by bio-Gas Plants being used for lighting and minor agricultural operations. Number of these plants per 100 villages (block wise) is high in central part of the district comprising of Shamli, Shahpur and Baghara Blocks (Table-5.8). The next belt of Block around them ha. relatively lesser development of the plants and the areas lying on the margin of the district have least development (Fig. 5.6).

MUZAFFARNAGAR DISTRICT

RURAL ELECTRIFICATION, (1989)

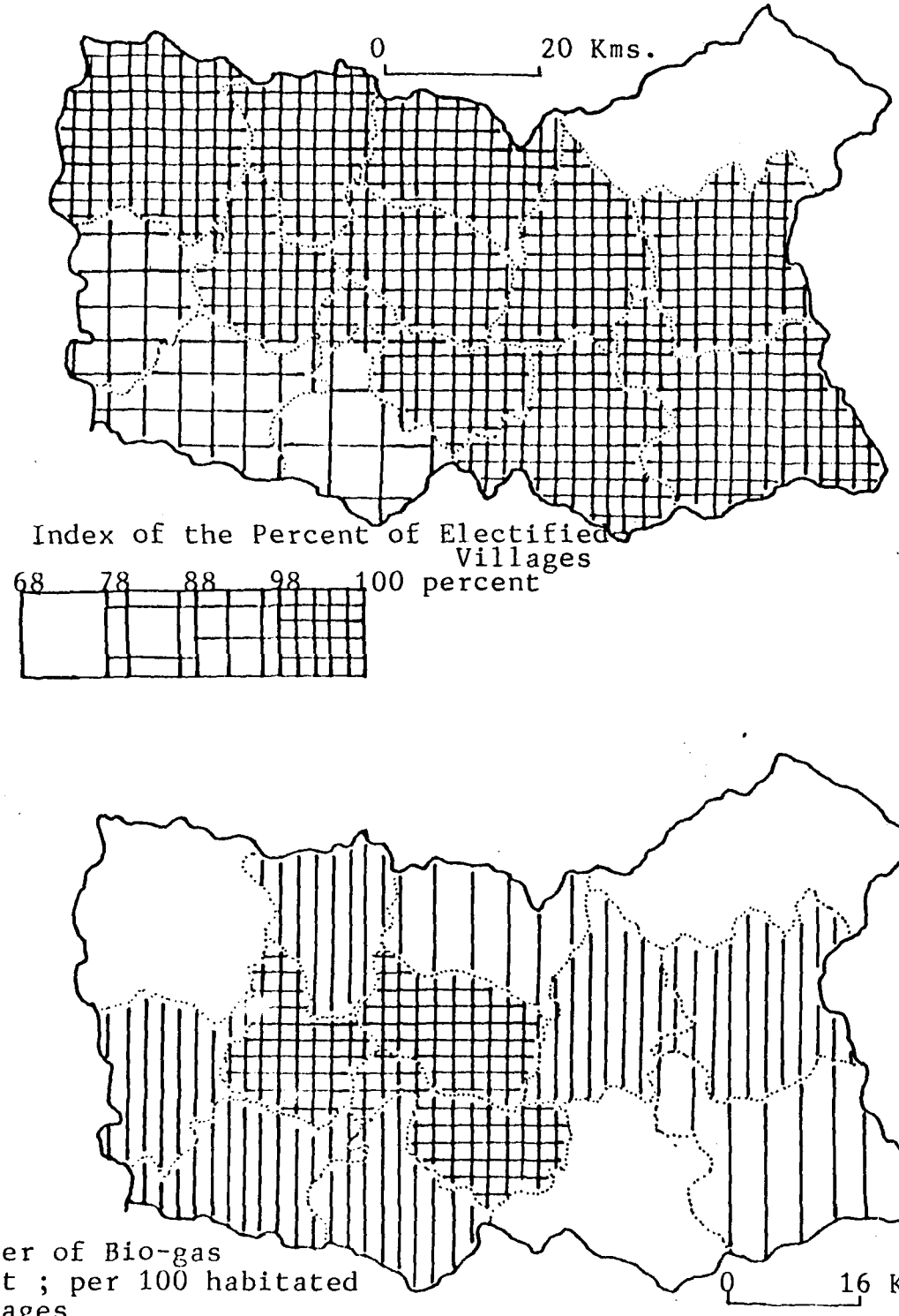


FIG. 5.6

TABLE - 5.8

BLOCKWISE DISTRIBUTION OF BIO-GAS PLANTS

S.NO.	Name of the Block	Numbers of Gobar Gas Plant per 100 habited villages
1.	Muzaffarnagar	525.9
2.	Baghara	824.0
3.	Charthawal	427.3
4.	Purquazi	197.3
5.	Kairana	563.8
6.	Shamli	563.8
7.	Thanabhavan	884.1
8.	Un	280.2
9.	Khatauli	278.2
10.	Jansath	377.3
11.	Morana	527.1
12.	Budhana	592.3
13.	Shahpur	826.2
14.	Kandhala	586.3
	Total(District)	467.3

Source : Statistical Handbook of Muzaffarnagar District, (1989).

Consumption Pattern Of Electricity In Muzaffarnagar District:

The distribution of electric line and consumption of hydro-electricity are highly linked to each other. District's consumption pattern of electricity is useful in the understanding of spatial pattern of electicity lines as infrastructre. In district the total electricity consumption in 1980-81 was 248.8 million kwh which has increased to 727.34 million kwh in 1988-89. It is obvious from the (Table-5.9) that during about one decade of time the elctricity consumption has become triple. In 1980-81 about 62.5 percent of the total consumption in the district was

TABLE - 5.9

CONSUMPTION PATTERNS OF ELECTRICITY IN MUZAFFARNAGAR DISTRICT

Sectors of Consumption	Consumption kwh (million) 1980-81	% age	Consumption kwh (million) 1988-89	% age
Irrigation	155.6	62.5	397.0	54.5
Industry	76.5	30.8	275.7	37.8
PRODUCTIVE USE		93.3		92.3
Domestic Use	14.8	5.9	40.9	5.7
Public Water Works	1.2	0.5	3.6	0.4
Commercial Lighting and minor power	0.4	0.2	9.1	1.2
Public lighting	0.3	0.1	0.8	0.1
NON PRODUCTIVE/CONSUMPTION		6.7		7.4
Total	248.8	100.0	727.3	100.0

Source : Statistical Handbook of Muzaffarnagar District. (1982 and 1989)

marked by irrigation purposes as compared to 54.5 percent in 1989. It means that a decrease of 11 percent was recorded due to the increasing consumption has increased from 30.8 percent 1981 to 37.8 percent in 1989. The decrease in agriculture sector does not mean the decline in actual consumption in terms of kwh as besides that 11 percent decrease in irrigation, the consumption in terms of kwh has increased from 185.6 (1980-81) to 397.04 (1989). The consumption of electricity shows continuously an increasing trend. In domestic uses it is 5.7 percent followed by public water works 0.4, commercial light and minor power 1.2, and public lighting 0.1 pe34rcent. The lion share of electicity consumption (92.3 percenmt) is made by

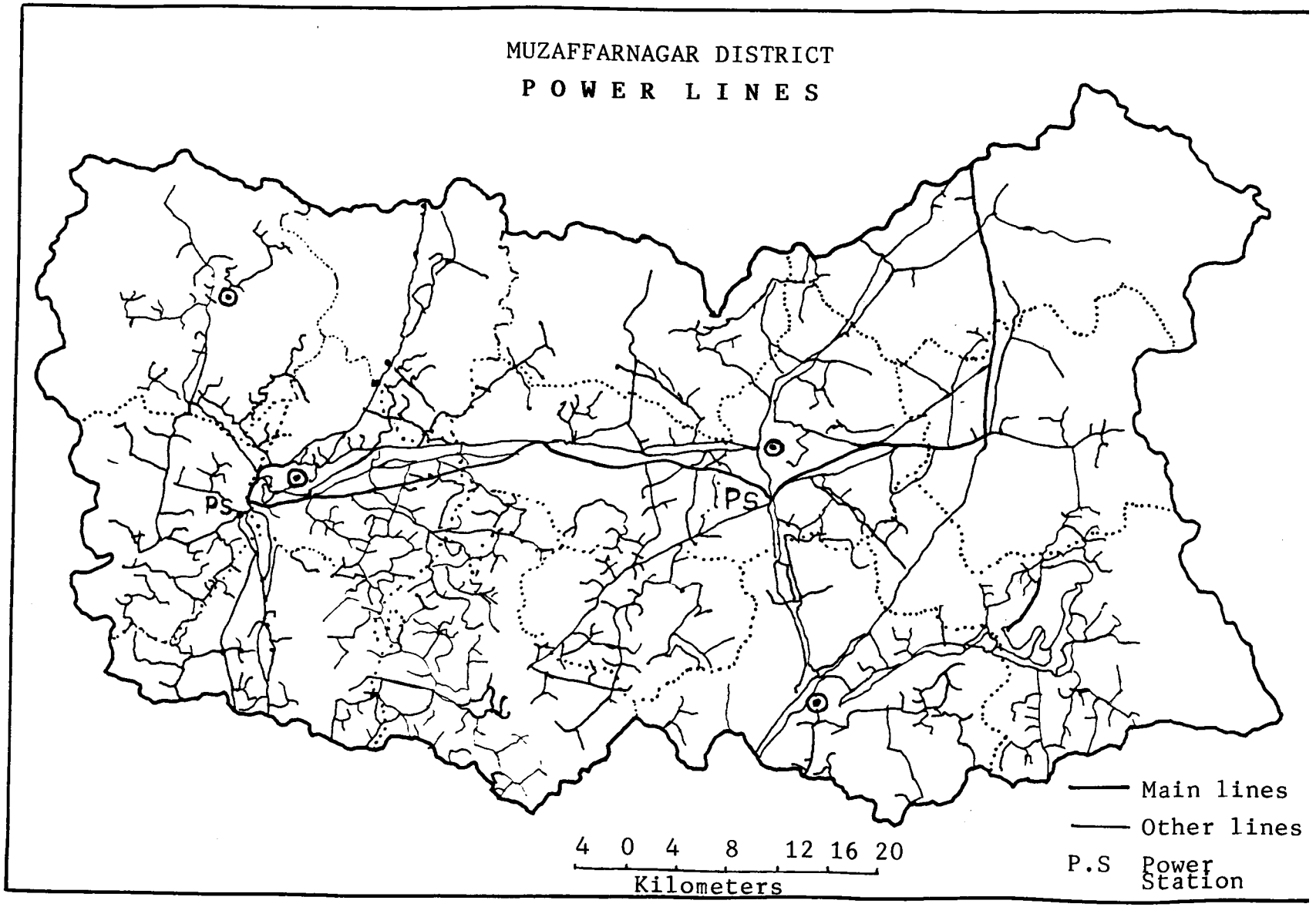

MUZAFFARNAGAR DISTRICT
POWER LINES
PS
PS
Main lines
Other lines
P.S Power Station
4 0 4 8 12 16 20
Kilometers

FIG. 5.5

agriculture and industrial sector which may be termed as productive use of electricity. While the remaining 7.7 percent is consumed purely non-productive/consumption uses. There is more or less similarity in percentage amount shared by productive and non productive uses as in comparison to whole country (Banarjee, 1989)[26]. During this decade 1.0 percent electricity consumption has increased in non productive uses as it was 6.7 percent in 1980-81 and 7.7 percent in 1989. It is also interesting to note that there is one percent decrease in productive consumption of the District. In agriculture and industrial purposes it was 93.3 percent in 1981 which has decreased to 92.3 percent in 1989. However, there is an overall increase in electricity consumption under different heads besides the up and down in percentage consur tion. The consumption rate of electricity in the area depicts the electrification and its multi dimension uses necessary for integrated development.

The spatial pattern of the electricity lines in the district very clearly suggests the spread of these lines from town into rural areas mainly alone transport routes as for example, towards Jhinjhana, Un and Chausana from Shamli town. Southern half of the district has developed close network of lines (Fig. 5.5). Like transport routes, the area of electricity lines are shaped mainly by rivers that

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26. Banerji, S., (1989) : '***Regional variation in the consumption of Electric Energy in India***, The Geography, Vol. XXXVI, No. January, A.M.U. Aligarh.

are effective barreris for all kinds of flows for the pauucity or bridges on them. Even canals are artificial barreris and. like rivers.cause absence of lines along them as is conspicuously apparent along the Upper Ganga Canal and its Anupshahr. Devband branch

TABLE (5.10)

Blockwise Percentage of Electrified Village

S.No.	Blocks	Total No.of Habited Villages	Electrified Villages	% age of Villages Electrified
1.	Muzaffarnagar	54	54	100.00
2.	Baghara	50	50	100.00
3.	Charthawal	66	66	100.00
4.	Purquazi	113	77	68.14
5.	Kairana	47	44	93.61
6.	Shamli	44	44	100.00
7.	Thanabhavan	58	58	100.00
8.	Un	101	101	100.00
9.	Khatauli	101	101	100.00
10.	Jansath	88	88	100.00
11.	Morana	59	59	100.00
12.	Budhana	52	40	76.00
13.	Shahpur	42	42	100.00
14.	Kandhala	51	49	96.00
	TOTAL	926	873	94.27

Source : Stetistical Handbook of Muzaffarnagar District. (1989).

and Eastern Yamuna Canal along with its Kairana branch. All flow lines widely spread in the east of Shamli squeeze at the narrow 'bridge' near Shamli town to be connectedto the western part. Power lines network is oriented to north-south direction. The two main lines are thus inclined and are alinked east-westat two power stations one each near Muzaffarnagar and Shamli.

To evaluate the distributional pattern or Electricity village level study has been taken. The district covers 1926 villages and 20 town. All 20 town are electrified where as 873 villages could get fully electrified upto 1990. It is about 94.27 percent villages become electrified as compared to 89 percent of 1981. Ten years agao about 100 villages were unelectrified which hav e remained only 53 to be electrified. Muzaffarnagar, Bagara, Charhawal, Shamli, Thanabhavan, Un, Khatauli, Jansath, Morana and Shahpur blocks are absolutely electrified. (Fig. 5.42). The remaining purquazi, Budhana, Kairanaand Kandhala exibit 36.12.12.3 and 3 settlement respectively are not electrified (Table 5.10) It is however, interesting that all the sheduled east settlements, in the district are electrified. About 600 villages have L.T. connections. Eastern wide belt along the Ganga still remains unelectrified for physiographic reasons. Similar is the case with Yamuna Khadar and along other smallerriverine trects in the district. Their absence in riverine tract of the Ganga, the Yamuna, the Hindon, Kali (West) Karsuni and even Katha Nala demonstrate this fact. Larger the river, more expanded Khadar tracts and widerareas of the absence of lines is the rule. Even a small river plays the role of barrier and disallows expansion of infrastructure as electricity lines and routes into them. Rivers disallow man-made flows across

their course and instead direct them in their parallel direction. Bridging these rivers at carefully selected points, at least at an interval of 10 kiloketers, is likely to generate economic growth more than any other effort of their development.

The tubewell irrigation attract the electricity. Tubewell irrigated areas have resulted in the most closely knit electricity distribution lines. Agricultural demand of electricity largely explains the distribution pattern of lines. Industries on theother hand, follow electrified areas. However, the physical barrier have played negative role in electrification of the area, but the whole of the district is a part of great plain, more precisely of Ganga-Yamuna Doab, therefore, the electrification in the district is increasing fast. Indeed, hydro-electricity has become now-a-days an essential and primary necessity of man to develop andpurpose. The electrification has positive relationship with other communication lines too. Besides several barriers the electrification is quite uniform.

CHAPTER - VI
REGIONAL PATTERNS OF AGRO-INDUSTRIALIZATION

AGRO - INDUSTRIAL STRUCTURE :

The data of industires collected through various sources have been analysed and about 72 types of agro-industries have been identified. These types were further categoriesed into 20 types of agro-industries on the basis of their mutual relationships (Table - 6.1).

Analysis of Agro-Industrial Structure:

In order to findout the agro-industrial structure, all twenty types of agro-industries of each scale (tiny, small and large) and places in 1989 have been taken into account. In Muzaffarnagar district total manufacturing activity comprises 468*a in organised sector, out of which 199 units are directly or indirectly related to agriculture sector.

The total number of agro-units in organised or unorganised and tiny, small and large scale sector are 7438*b.

Out of 7438 agro-units, tiny sector comprises 6880, small-scale sector comprises 530, while, remaining 28 agro-units comprises of large-scale sector (Table 6.2).

Out of twenty eight large scale agro-units paper and paper board exibits 15 followed by Gur-Khandsari and Sugar (5), Chemical industry(3), milk and vegetable industry (2), distillery and blending (2) and cold-storage and ice(1).

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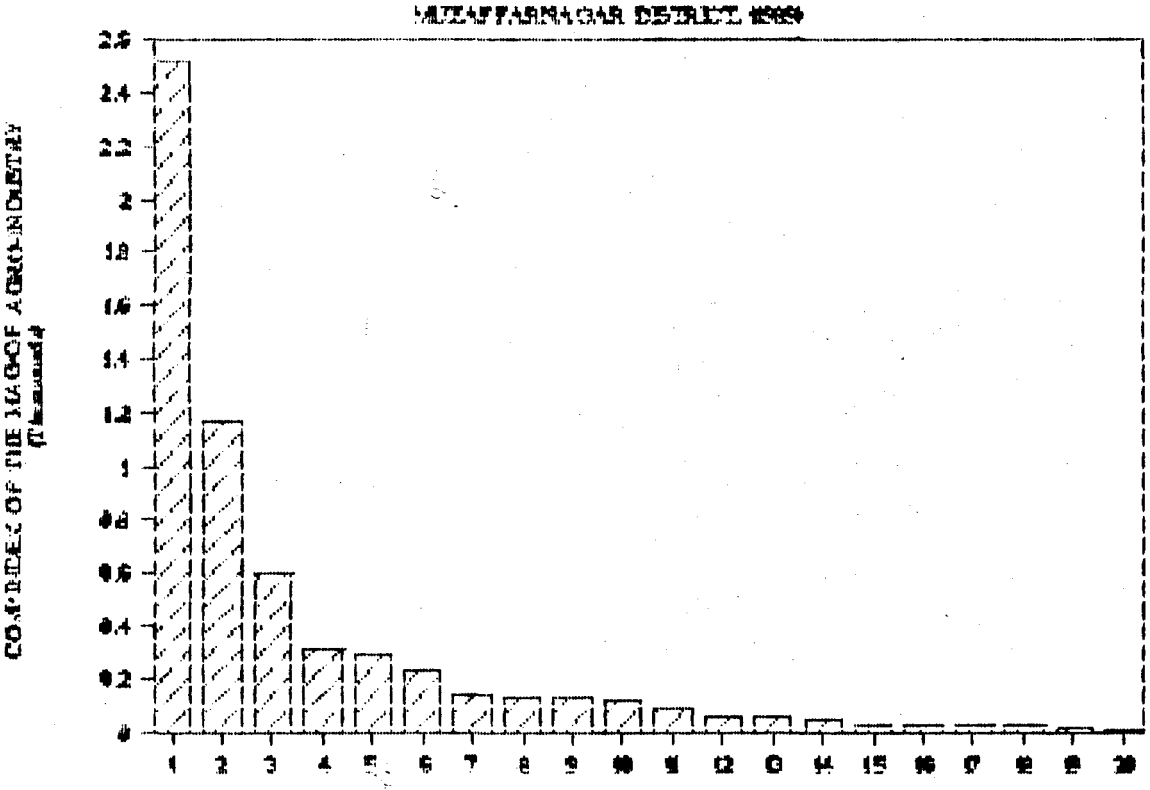
*a : Office of Inspector of Factories Muzaffarnagar, 1989.
*b : Composite figure of two offices :
a) Office of the Inspector of Factories, Muzaffarnagar.
b) District Industries Centre, Muzaffarnagar.

TABLE : 6.1

S.No	Types of Agro-Industries	Included other parts
1.	Gur - khandsari and sugar industries	Sugar. cane-crusher. gur and khandsari
2.	Grain processing industries	Rice-mill and bran. rice husk. flour - mill. dal mill
3.	Oilseeds and fabrics	Edibial oil. spelar. mustard oil. oil and oil cake
4.	Milk and vegetables	Vegetable and animal fats. fruit and vegetable processing. creem. ghee
5.	Cotton textile	Redy-mate garments. mats. drawing and painting of textile. rags. filter from west jute. pillow cover. bedsheets
6.	Hand loom and power loom	-
7.	Woollen textile	Woollen blankets and shauels. woollen wears
8.	Rubber product	Ricklem rubber. thread rubber. retread rubber. gum. cycle rickshaws rubber tubes.
9.	Confectionary	Backery (biscuits) papa. bread processing.
10.	Cattle feeds	-
11.	Paper and board	Duplex cratt paper. carogated sheets. paper mill board. card boxes. card board. paper cann. vax coated repairing paper and colour. paper rolling binding. copy - register
12.	Chemical industries	Sulpher powder. vax candles. sort drinks. oxygen gas. ayurvedic medicine. plastic goods. cann. polythene. biological seeds. calciam carbonate
13.	Engineering industries	Sulpher rolls. sugar mill parts. grinding of cane crusher. rabrication of sugar machinery parts. paper reel corn. iron washer and washer cutter. gas bulb wapour.

14.	Fertilizers and pasticides industries	N.P.K. fertilizers. Pasticides. B.H.C.. insectrisoids. bon-powder.
15.	Construction material	Cement. pat jali. brick kilns
16.	Leather product	Leather-goods. leather shoes. slippers.
17.	Cold storage and ice factory	Ice kandi
18.	Agricultural implements	Harrow - disk - wheal. thresner. m.m. round. tore -machine. cutting machine. tractors. servicing or tractors and c.c. blead. fawada. shawals. repairing and servicing or nojil and plinzers. desal engines. cultivators. central fugal pump. axel. chapts. kart. troli.a.d.v.rim.assembling or bogi.a.d.v.wooden bogi. centry rugal pump. squal brass. angle. tillers. tractors pulies. p.t.o. pulies. Hassian rangs cuttings. engine gass cut.
19.	Distillery and blending	
20.	Wooden based product	

AGRO-INDUSTRIAL STRUCTURE OF



Types of Agro-industries

Reference : Table 6.2

TABLE - 6.2

AGRO - INDUSTRIAL STRUCTURE OF MUZAFFARNAGAR DISTRICT. 1989

S. no	Types of Agro-industries	Number of Agro-units			No.of Agro-units converted in Small-Scale equivalent	Reduced Scores	Labour		Capital Investment(loss of Rs)		Composite Scores	% age	Cumulative %age
		Tiny Scale	Small Scale	Large Scale				Reduced Scores		Reduced score			
1.	Gur-khandsari and Sugar Industry	-	169	5	419	380.2	35681	1365.62	4096.24	774.13	2519.98	42.00	42.00
2.	Paper and Board	5	15	15	765	694.19	1300	49.75	2222.0	419.94	1163.88	19.40	61.40
3.	Handloom and Powerloom	6463	-	-	259	235.02	7989	305.76	338.95	64.05	604.83	10.08	71.48
4.	Agricultural-Implements	267	38	-	49	44.46	1615	6181	1074.28	203.03	309.30	5.16	76.64
5.	Chemical Industries	17	28	3	178	161.52	545	20.85	552.78	104.47	286.84	4.78	81.42
6.	Milk and Vegetable Product	-	3	2	103	93.46	390	14.92	633.39	119.70	228.08	3.80	85.22
7.	Grain Processing Industries	-	28	-	28	25.40	542	20.74	508.52	96.10	142.24	2.37	87.59
8.	Construction Material	-	41	-	42	37.20	2121	81.17	57.89	10.94	129.31	2.16	89.75
9.	Cold-Storage and Ice	-	18	1	68	61.70	170	6.50	290.96	54.98	123.18	2.05	91.80
10.	Distillery and Blending	-	-	2	100	90.74	213	8.15	100.00	18.89	117.78	1.96	93.76
11.	Engeenring Industry	12	48	-	48	43.55	384	14.69	133.04	25.14	83.38	1.39	95.15
12.	Wooden Based Products	-	53	-	53	48.09	156	5.97	35.88	6.78	60.84	1.01	96.16
13.	Rubber Products	-	19	-	19	17.24	170	6.50	167.57	31.66	55.40	.92	97.08
14.	Oilseeds and Fibers	46	20	-	22	19.96	393	15.04	88.86	16.79	51.79	.86	97.92
15.	Cotton-Textile	-	17	-	17	15.42	132	5.05	42.61	8.05	28.52	.48	98.42
16.	Confectionary	-	18	-	18	16.33	126	4.82	32.45	6.13	27.28	.45	99.31
17.	Fertilizers and Pesticides	-	6	-	6	5.44	114	4.36	89.22	16.86	26.66	.44	98.86
18.	Leather Products	70	3	-	5	4.53	154	5.89	64.01	2.09	22.51	.38	99.60
19.	Woollen Textile	-	4	-	4	3.62	52	1.99	52.37	9.89	15.50	.26	99.95
20.	Cattle feeds	13	2	-	2	1.81	9	0.3	1.99	0.37	2.48	.05	100.00
	TOTAL	6880	530	28	2204		52256		10582.52		5999.78		

Source : * District Industries Centre, Muzaffarnagar, 1989
The Inspector of Factories, Muzaffarnagar, 1990.

It is worthy to note that all twenty eight large-scale agro-units fall in only 6 types of agro-industries whereas, the remaining 14 types of agro-industries have not even a single unit in large-scale sector (Table 6.2).

In small-scale sector, gur-khandsari and sugar industry registered the highest number of 169 followed by

wooden based products (53), engeeniring industries (48), construction materials (41), agricultural implements (38), grain-processing industries (28), oilseeds and fibros (20), rubber products units (19), cold-storages (18), cotton textile (18), confectionary (18) and paper and paper board (15). The least number has been recorded in cattle-feeds (2) followed by leather products (3), milk and vegetable (3), woollen textile (4) and fertilizers and pesticides (6) in the study area. Distillary and blending and handloom and powerloom types of agro-industring have not any unit in small-scale sector.

In tiny-sector , the highest number i.e. (6463) is recorded by handloom and powerloom out of the total (6880) tiny-scale agro-units of the study area.

The Approach For Measuring Agro-Industrial Structure

Identification of substantial types of agro-industry is done by measuring the magnitude of all twenty types of agro-industries by labour, capital-investment and number of agro-units (converting in small- scale equivalent).

Conversion of large-scale and tiny - scale units of each twenty types of agro-industries to small-scale equivalent has been done on two separate bases :

1. Average fixed capital size per unit (AFCS/unit) is used for calculating small-scale equivalent of

large-scale units. This base is very important in case of large-scale and small-scale industries as it more often governs the components of industrial magnitude. AFCS/unit of small-scale sector each of Rs. 2.5 lakh while that of large scale unit it is Rs. 125 lakh. One large-scale unit thus have 50 small-scale equivalent.

2. Average labour size per unit (ALS/unit) is based for calculating small-scale equivalent of tiny units. No other criteria could be used for tiny units conversion due to non-availability of compairable data of small-scale and tiny-sectors. Besides, labour size assumes significance in these two sectors and represents industrial magnitude more truely. ALS/unit of iny sector is 2.4 persons while that of small-scale it is 60 persons. One tiny units's small-scale equivalent thus comes to .04 or to say that 25 tiny units equal to one small-scale unit.

Small-scale values of all twenty-types of agro-manufactureindustries thus have been calculated.

Finally, to find out the substantial types among them the composite index of the magnitude of an industry has been calculated. In order to calculate the composite index of an industry, the reduced scores has been counted for the number of units (small-scale equivalent), labour and

capital.investment. Following formula has been applied to calculate the reduced scores :

$$Cf = \frac{100 \times T}{AV}$$

where,

Cf = Converted figure.
T = Value of the individual.
Av = Average of the column.

Composite index of the magnitude of an industry may be expressed as follows :

Reduced score R = (.04.Tu + 1.Su + 50.Lu)

where,

Tu = Number of tiny scale units.
Su = Number of small scale units.
Lu = Number of large scale units.

Cimi = R + rL + rCi

where,

R = Above mentioned
rL = Reduced score of labour
rCi = Reduceed score of Capital investment
Cimi = Composite index of the magnitude of an industry

Cimi values for each of 20 types of agro-industries was calculated and finally expressed as percentages. Significant types of agro-industries get isolated. With this an overall and general agro-industrial structure has been evaluated.

Spatial Pattern of Agro-Industrial Structure

On the basis of composite index of the magnitude of an industry, out of twenty types of agro-industries, 3

industries have been identified as major, 9 industries as significant and the remaing 8 industries as insignificant. They have been shown by A,B, and C in figure 6.1.

Major types of agro-industries reflect substantial part of the agro-industrial structure of the area. In this category, gur-khandsari and sugar, paper and paper board, and handloom and powerloom have been indentified. These three major agro-industries accounts for 71.48 per cent of the area's total agro-industrial magnitude. Major types of agro-industries along with their magnitude in percentages are :

S.No.	Name of the Agro-industries	Percentage of magnitude
1.	Gur-Khandsari and Sugar	42.00
2.	Paper and Paper Board	19.40
3.	Handloom and Powerloom	10.08

Significant types of agro-industries are 9, acounting for 24.68 per cent of the total industrial magnitude of the district. In this category, agricultural implements, followed by chemical industry, milk and vegetable products, grain-processing industry, construction materials, cold-storage and ice, distillery and blending, engineering industry and wooden based products have been identified. It is worthy to mention have that all these types of agro-industries, excluding construction material

are mainly located at urban places in the entire region. Significant types of agro-industries along with their magnitude in percentages are as follows:

S.No	Significant types of agro-industries	%age of magnitude
1.	Agriculture implements	5.16
2.	Chemical industry	4.78
3.	Milk and vegetable products	3.80
4.	Grain processing industry	2.37
5.	Construction material	2.16
6.	Cold-storage and ice	2.05
7.	Distillery and blending	1.96
8.	Engeeniring industry	1.39
9.	Wooden based products	1.01

There are remaining 8 insignificant types of agro-industries accounting for only 3.84 per cent of the total agro-industiral magnitude in the study area. These agro-industries are rubber products (0.92 per cent) followed by oilseeeds and fibres (0.86 percent) cotton textile (0.48 percent), confectionary (.045 per cent) fertilizer and pesticides (0.44 per cent), leather products (0.38 per cent), wollen textile (0.26 per cent) and cattle feeds (0.05 per cent).

The following generalisations may be drawn :

1. Major types of agro-manufacturing industries reflect a substantial proportion of the total industries located in the area.
2. Two major types of agro-industries namely, gur-khandsari and sugar and paper and paper board

industires comprise 20 large-scale agro-units out of 28 in the study area. Further, these types also include 184 small-scale agro-units out of the total 530 units in the region.

3. It is also important to note that the third major type of industry namely, handloom and powerloom consists 6463 agro-units in tiny sector out of 6880 units is the district.

4. The group of major types or agro-manufacturing industries share 86 per cent labour out of the total 52256 labourers engaged in agro-industrial units in the study area. the share or gur-khandsari is much higher i.e. 68 per cent.

5. From the poihnt of view of capital investment two major types, namely, gur-khandsari and sugar industry followed by paper and paper board recorded 60.00 per cent or the total (10582.52 lakhs Rs.) agro-industrial capital investment. Moreover, gur-khandsari and sugar industry individually consumes 38 per cent of the total agro-industrial capital investment of the region.

6. In terms of significant types, namely chemical industry, milk and vegetable products, cold-storage and ice, and dis illery and blending combindly possesses 12.59 per cent of the agro-industrial magnitude of the district (Table No.

6.1).

7. The significant types of agro-industries recorded only 11.74 per cent labour out of 52256 labourers engaged in all types of agro-industries in the district. It shows variations in terms of labour input in agro-industries.

8. As regards capital investment, 32.00 percent has been recorded by the total 197 significant types of agro-industries.

9. It has been observed that the amount of the agro-industrial magnitude is highly governed by the large scale sector. For instance, the agro-industries which have their units in large-scale sector recorded 73.99 per cent of the total industrial magnitude.

10. It may also be observed that major and significant types of agro-industries are either utilizing raw materials from agricultural products or they are supplying implements for the development of agricultural sector.

11. In terms of absolute structure of agro-industries, it is very wide as it is evident from the Table 6.1 that in the district there are 72 types of agro-industries which have been grouped into 20 types. But the comulative percentage of agro industrial-magnitude shows that out of the twenty

groups of agro-industries. three major types namely, gur-khandsari and sugar, paper and paper board, handloom and powerloom explain 71.48 per cent of the area's total agro-industrial magnitude. It unfolds the fact that the operational structure of the industries is very narrow and it is concetrated in a few types of industries.

12. Industrial structure viewed in terms of areas of demand of the industrial out put is quite revealing. An agrarian society, thus beings prodominantly a consuming society, has to industrialize initially on the consumption market, mainly food articles. the magnitude of machines is relatively normal.

13. District Muzaffarnagar predominantly belongs to an agrarian landscope. Agrarian industrial structure suggests that agriculture lies at the deadheart of industrial evolution. Around agriculture is woven the industrial structure of such areas. Most of the manufacturing is either supported by agricultural out put or by the market of agriculture sector.

Its development and eventual structure formation is the function of specialisation of either an industrial or a commercial or a surplus

of food grain crops. Sugar cane in the study area has raised industrialization by provides sugarcane on the one hand, and by increased demand of machinery on farms and factories,on the other. Thus as the industrial production system expands. it becomes complex by self-generated structural markets as far example, paper and rubber in the present case.

14. The over-all analysis of the agro-industiral structure in the district shows that the major types of agro-industries have been developed in the district due to the availability of raw materials derived from agricultural products. while other types of industries have been developed due to the availability of market. So, in future the tempo of major industries may be intensified with the increased production of agricultural products.

BLOCKWISE DISTRIBUTION OF AGRO-INDUSTRIES

In Muzaffarnagar district, gur-khandsari and sugar industries one of the major industry which has observed 42 per cent of the area's total industiral magnitude. District Muzaffarngar is located in the Upper Ganga-Yamuna Doab and, is known as the 'Sugar bowl' of nothern India. The development of gur-khandsari and sugar industry is due to the availability of raw material in the study are. Sugar can

is one of the most important ***kharif*** crop of the district and the area under it has been showing aconsistent increase From 28.770 acres in 1901 it rose to 4.26.112 acres in 1989-90. The old and indigenous varieties of sugarcane have now altogether been replaced by better and high yielding varieties like Co-802, Co-767, Co-64, Co-1158, Bo-64, Bo-70, and Bo-54. In the district 38.07 per cent area out of the total cropped area of the regions under sugarcane cultivation. Being a commercial/cash crop and its nature to provide a large amount of returns, as compaired to other crops of the region, sugarcane crop attracts the attention of the farmers living in rural area's of the district. Moreover, sugarcane crop ranks first in the cropping patterns, except in few blocks where wheat replaces it.

Uttar Pradesh sugarcane Research Centre located at Muzaffarnagar, is playing an importnat role in the development of sugarcane cultivation. Canals and tubewells are the chief sources of irrigation which give support to high yielding varieties in the district.

The spatial distributional pattern of labour engaged in gur-khandsari and sugar industry, reveals its concentration in four blocks of the district. Morana blocks records 26.02 per cent labour force engaged in this industry, followed by Shamli (13.38), Jansath (12.29), Khatauli (10.76),Charthawal (10.02) and Muzaffarnagar (9.32) per cent. The least number has been recorded by Shahpur

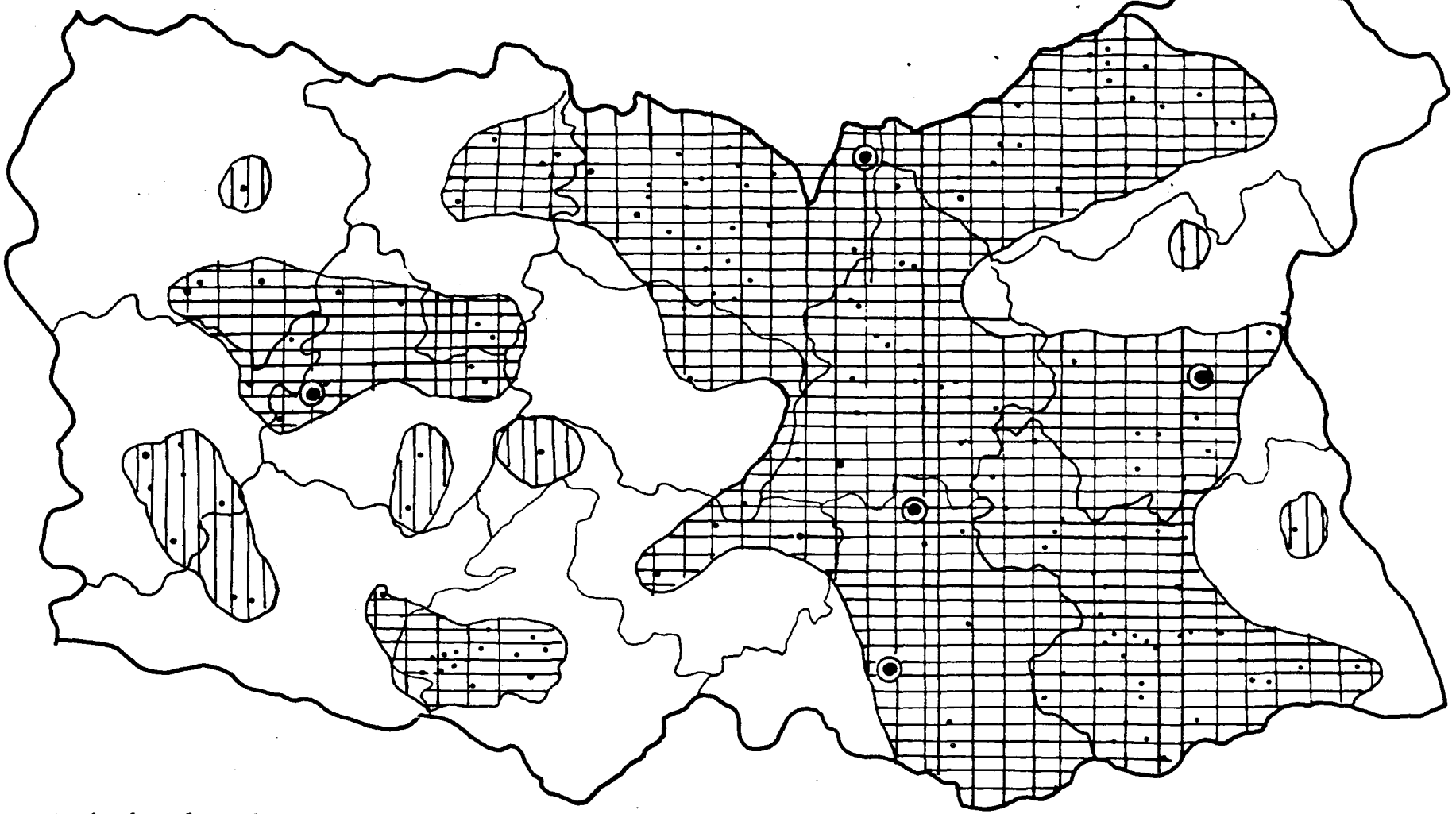
block (.54) follwed by Baghara (.54), Kandhala (.79), Un (.92), Thanabhavan (2.77), Kairana (3.42), Budhana (4.55) and Purquazi (4.59 per cent). The concentration of the gur-khandsari and sugar industry in Morana, Shamli, Jansath, Khatauli, Charthawal and Muzaffarnagar is due to the more availability of sugarcane as they record 43.92, 42.71, 46.36, 48.08 and 37.39 per cent croppsed area respectively under sugarcane cultivation. Moreover, spread of efficient transport, electricity, market (Gur-mandies) and other industrial infrastructure facilities and a suitable physical environement have been contributed to support it. It is worthy to note that 81.79 per cent labour force to gur-khandsari and sugar industry is recorded in only 6 blocks out of 14 blocks of the district. It shows the uneven spatial pattern of the location of gur-khandsari and sugar industry in the study area (Table 6.3).

The number of gur-khandsari and sugar industry revealas that Jansath blocks consists the highest number (38) followed by Charthawal (24), Purquazi (24), Muzaffarnagar (21), Budhana (13), Morana (10), Shamli (9) and Khatauli (8). The lowest number (2) has been recorded by Shapur block followed by Baghara (2), kandhala (3), Un (4), Thanabhavan (7) and Kairana (7).

The district has 5 sugar mills in the large scale sector, out of which Khatauli block has two and Shamli, Charthawal and Morana blocks have one each. The year wise

MUZAFFARNAGAR DISTRICT

SUGARCANE INDUSTRIAL ZONE



Very High developed zone

Highdeveloped zone

Low sugarcane industrial zone

Sugarcane mill centres

Sugarcane crusher centres

0 4 8 16

Kilometers

FIG.6.2

increasing average of sugar cane crop provides prospects for more mills. But the location of sugar mill units are further creating regtional imbalances. The four out of five sugar mill units are located in the eastern part of the district. Only one sugar mill, located at Shamli, Caters the requirements of more than half of the sugarcane crop area of the district. It is also an interesting point that out of the five sugar mill units, four are located along the railway line and roadsides have not been given prererences except Morana (Fig 6.2).

The foregoing analysis of gur-khandsari and sugar mill units of district Muzaffarnagar reveals that study area has recorded several disparities in sugarcane based agro-industries and constitute fairly three distinct zones.

1. **Hihgly Developed Zone**

It spreads over Jansath, Charthawal, Purquazi, Muzaffarnagar, Budhana, Morana, Shamli and khatauli blocks of the district. Fig. 6.2. The hinterlands of Budhana, Purquazi and Muzaffarnagar blocks headquarters are the exceptions cases which falls within this category of highly developed zone. Another intresting point of this category is that, most of the highly developed parts of the district are located in the central southeastern part of the district (Fig 6.2).

2. **Moderatly Developed Zone**

The entire central eastern and central

western part of the distrcit lie in moderatly developed zone. The central-north-western and central-southern parts of the district are legging behind inspite of the fevourable climate for sugar cane manufacturing activities.

3. Backward Zone

The entire rural area's of Kairana, Kandhala Shapur, Baghera and Un blocks are totaly backward in terms of sugarcane based industrial activities. Roughly half of the Un block, almost three fourth Kandhala and one-fourth area of Purquazi block are industrially back ward tracts.

The backwardness of these tracts may be explained in terms of insociant attitude of the District Industry office. Some physical barriers are also responsible for the backwardness of these tracts. the entire western and eastern villages of the district located along the Yamuna and the Ganga rivers respectively are affected by either ***reh, swamp*** or ***Khadar*** characteristics. Another significant attribute which plays an important role in the establishment of sugarcane based agro-industrial activities is the availability as well as efficiency of the transport network. Keeping in view the industrial location theoryd of Alped Weber, large-scale sized sugarcane based industrial units can be successful only at those places which have sufficient infrastructure. All the industrial activities based on sugarcane have their raw material in ruraql areas but the processing of raw material may be beneficial ir the location

of the unit lie in rural areas. The backward tracts of the district lack in infrastructural facilities and other important components associated with cane based industries. the disparities in levels of cane based agro-industrial activities have not resulted in one day. When we compare data partaing to khandsari units we find that khandsari units are declining day by day and most of the sugarcane based industrially backward tracts of this district have suffered a lot. The performace and efficiency of crushers (Kolhus) and mill units depend upon the availability of repair facility as well as level of rural technology. Jaggery (gur) making is done on indigenous technology hence rural artisans associated with gur making have sufficient experience, and have presented good prospectus for gur making in the villages. A large number of the small cane growers follow cottage pattern of cane based agro-industrial activity in the district, and claim further better prospects in future too as khandsari units are declining day by day. According to a rough estimate approximately 40 percent cane crop goes to gur-making (cottage-sector), about 35 percent cane crop goes to mill sector and remaing 25 percent is being consumed by khandsari sector.

It can be illustrated well that the cane based industrially backward zones or gap areas have some future prospects for the khandsari sector but a challenging competition with jaggery (Cottage sector) will give again a hard hit on khandsari sector.

The analysis tends to suggest that there are only two sectors which have better prospects for cane based agro-industrial activity for the survival of the economy of this district, one, the cottage sector and the other is mill sector.

TABLE 6.3

BLOCKWISE ENGAGED LABOUR IN AGRO-INDUSTRIES IN MUZAFFARNAGAR DISTRICT, 1989.[8]

Types of Agro-Industries	Blocks														
	Baghara (1)	Budhana (2)	Charthaval (3)	Jansath (4)	Kairana (5)	Khatauli (6)	Kandhala (7)	Muzaffarnagar (8)	Morana (9)	Purqaz (10)	I Shamli (11)	Shahpur (12)	Thanabhavan (13)	Un	Distr-ict Muzaff-arnagar
1. Gur-khandsari and Sugar	0.57	4.55	10.02	12.29	3.42	10.76	0.79	9.32	26.02	4.59	13.38	0.52	2.77	0.92	100.00
2. Paper and paper board		0.15		0.38	1.15	0.53	0.69	67.15			29.92				100.00
3. Handloom and Powerloom	5.0	5.11	6.48	6.50	12.51	13.14	5.15	22.53	1.25	3.75	5.75	6.50	3.75	0.02	100.00
4. Agricultural Implements	.24	1.85	0.68	1.23	7.16	23.09	0.9	20.92	0.30	0.60	39.50	0.37	1.91	1.05	100.00
5. Chemical-Industry		0.55	1.10	1.46	4.95	0.73	65.68	0.36		23.66		0.73			
6. Milk and - Vegetable						35.64		63.84			0.51				100.00
7. Grain - processing			2.95	12.17	5.90		2.95	31.36		11.25	6.08	10.33	16.97		100.00
8. Construction material	8.10	6.50	18.34	2.84	7.21	4.57	2.16	36.21		1.74	7.65	10.65			100.00
9. Cold-storage and Ice			1.76			8.23	7.25	49.41			30.30		3.52		100.00
10. Distillery and Blending						46.94					53.05				100.00
11. Engineering Industry		11.99	1.04	7.55	6.25	7.29	1.04	65.05			17.70		1.04	1.04	100.00
12. Wooden based Product		12.82	1.28	10.25	1.53		10.25	19.87			21.79	1.28	5.76	5.72	100.00
13. Rubber Product.					11.76			2.94			75.24		10.04		100.00
14. Oilseeds and Fibres	3.05	0.76	0.59	4.07	3.05	2.54	5.34	63.35	1.27	2.03	8.65	1.78	2.79	0.76	100.00
15. Cotton Textile	3.03		6.81	3.03	20.45			3.78		11.36	21.21		30.30		100.00
16. Fertilizer and Pesticides		3.50						96.50							100.00
17. Confectionary				14.28	7.93		7.14	62.69			7.93				100.00
18. Leather Product	5.19	3.24		4.54	20.77	27.92	12.98	12.33			1.29	10.38		1.29	100.00
19. Woollen textile	5.76						15.38				78.84				100.00
20. Cattle feeds			55.55				44.44								100.00

Source :District Industries Centre, Muzaffarnagar, 1989.

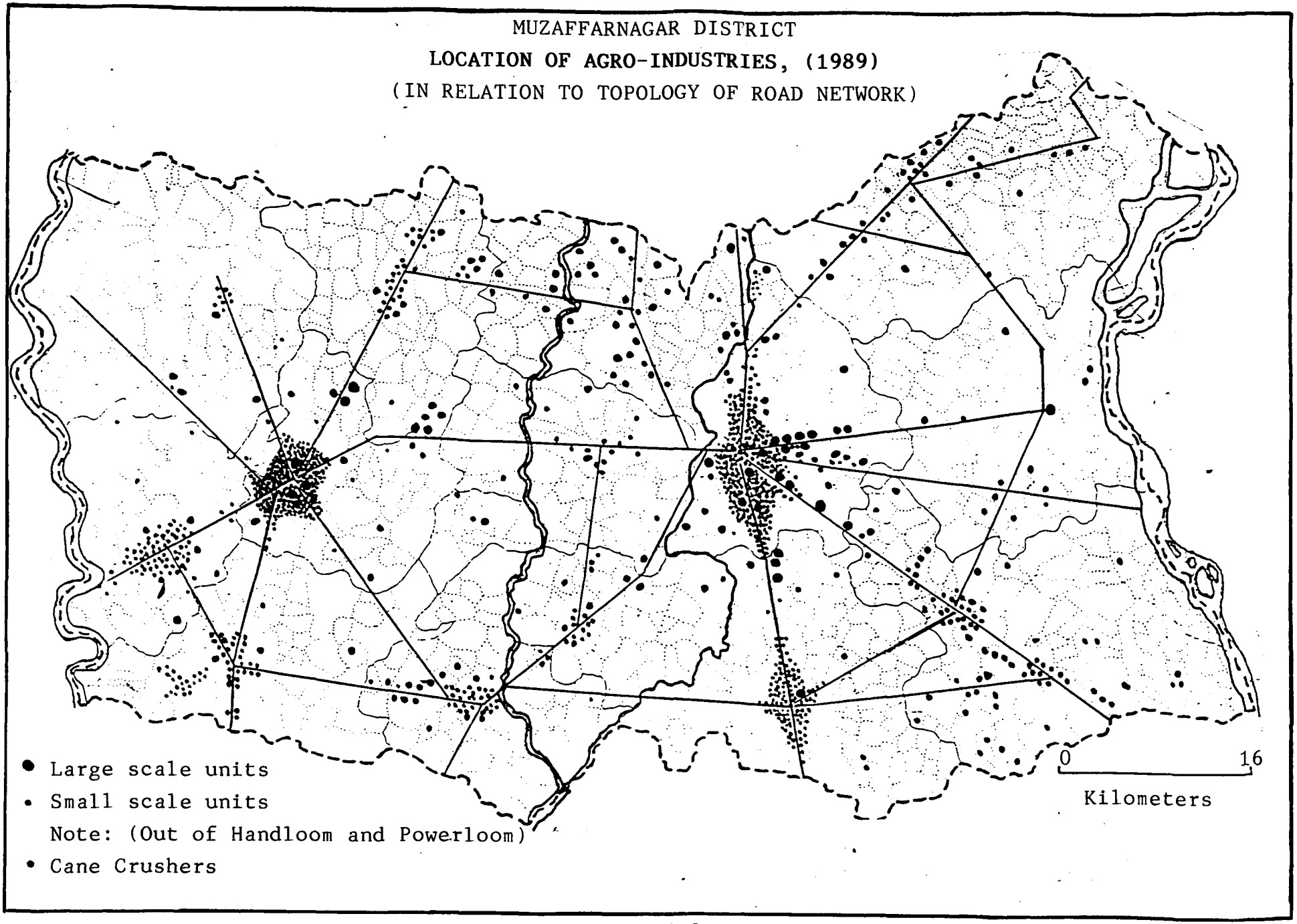

MUZAFFARNAGAR DISTRICT
LOCATION OF AGRO-INDUSTRIES, (1989)
(IN RELATION TO TOPOLOGY OF ROAD NETWORK)
Large scale units
Small scale units
Note: (Out of Handloom and Powerloom)
Cane Crushers
0
16
Kilometers

FIG. 6.3

The Inspector of Factories, Muzaffarnagar, 1990.

Paper and paper board industry is the second largest industry which accounts for 19.04 per cent of the area's total agro-industrial magnitude. Paper and paper board industry records the largest number of large-scale factories in the district. The spatial distributional pattern of the number of the large-scale factories shows its concentration at two places in the district. One is around Muzaffarnagar and other near Shamli. These two blocks comprise the total (15) large-scale paper factories. Ten factories are located in Muzaffarnagar block and five in Shamli. All the ten paper factories are sequencely, located within a radius of 20 km from the city Muzaffarnagar. In Shamli block paper factories are locted on two separate roads, one Shamli to Saharanpur road and the otherone Shamli to Muzaffarnagar road. These two roads have four paper and paper board factories each having two and the remaining one factory is located at Shamli city. The spatial distribution of labour of paper industry reveals its concentration more or less at two places of the district. Table 6.3 shows that highest number (67.15 per cent) has been recorded by Muzaffarnagar block followed by Shamli (29.92 per cent). The development of paper industry in these two blocks of the district is due to the availability of high developed industrial infrastructure. Secondly, both these two blocks are well connected to Delhi for marketing and Saharanpur for raw material. The Ganga-Khadar's coarse grasses also provide raw material for factories to those

which are located near Muzaffarnagar. The by - products of sugarcane industry. are used by some paper and paper board factories as their raw material.

Handloom and powerloom is the third major agro-industry. as it has 10.08 per cent or the area's total indsutrial magnitude (Table 6.3). The spatial pattern of labour size of handloom and powerloom reveals its highest concentration at Muzaffarnagar. Khatauli and Kairana blocks of the district. It has been observed that the highest concentration of handloom and powerlooms is mainly at those places which are muslim dominated in the study area. Table 6.3 shows that the highest concentration of labour engaged in this industry has been recorded in Muzaffarnagar block (22.53) followed by Khatauli (13.14). Kairana (12.51). Shahpur (6.50). Jansath (6.50). Charthaval (6.48). Shamli (5.7). Kandhala (5.15). Budhana (5.11) and Baghara (5.00 per cent) blocks. The lowest percentage is in Un block (0.2) followed by Morana. Thanabhavan. and Purquazi blocks of the district.

Agricultural implements rank fourth according to the agro-industrial magnitude. Such industries are located in large urban centres. which are econimically more suitable. Shamli block comprises the highest percentage (39.50) of labour size followed by Khatauli (23.09). Muzaffarnagar (20.95) and Kairana (7.78). The lowest percentage (0.24) has been recorded by Baghera block followed by Morana. Shahpur. Purquazi. Charthawal. Kandhala.

Un, Jansath, Budhana and Thanabhavan with per centage shares of 0.30, 0.37, 0.60, 0.68, 0.90, 1.05, 1.05, 1.23, 1.85 and 1.91 respectively. A close observati n of such manufacturing enterprises reveals that sales cum-manufacturing goes under one roof: road front side being used for show rooms (sales counter) while backsides are used for manufacturing.

Chemical industry is mainly located at urban places in the distrcit due to the availability of market and other industrial infrastructure. The industry is highly concentrated at Muzaffarnagar city, being the biggest urban centre of the district. Muzaffarnagar block has recorded the highest number of labourers (65.68 per cent) followed by Shamli (23.66 per cent). The remaining about 11.0 per cent labour is spread over Kairana , Jansath, Charthawal, Khatauli, Kandhala, Thanabhavan and Budhanan with percentage share of 4.95, 1.46, 1.10, 0.73, 0.73, 0.73 and 0.55 respectively.

Milk and vegetable industry comes on the 6th place among the twenty types of agro-industires. Milk and vegetable industry has two factories in the large-scale sector which are located at Muzaffarnagar (milk) and Khatauli (vegetable oil). The milk based factory was put-up to take the advantage of the surplus milk in this area. But the unit faced difficulty in selling its products. The spatial distributional pattern of labour engaged in milk and vegetable manufacturing reveals its concentration at two places namely, Muzaffarnagar and Khatauli. This kind of

industry is found in only three blocks of the district. The highest percentage (63.84) of labour has been recorded in Muzaffarnagar block followed by Khatauli (35.64). The analysis tend to conclude that the dairy and vegetable industries are not properly developed inspite of the surplus raw material available in the study area.

Grain processing industry is a significant industry among the agro-industries of the region. Its distribution is recorded in nine blocks of the district. Grain processing industry mainly consumes the raw material which comes from two crops namely wheat and rice. The area records a high wheat surplus. Therefore, wheat crop provides high potentiality for wheat based processing products. In case of paddy crop, it also records surplus in four blocks of the district. The grain processing is concentrated in two blocks namely, Muzaffarnagar and Thanabhavan. The distribution of labour shows that Muzaffarnagar block has the highest percentage (31.36) followed by Thanabhavan (16.97), Jansath (12.17), Purquazi (11.25) and Shahjpur (10.97). The low percentage have been observed in Kandhala (2.95) followed by Charthawal (2.95) Kairana (5.90) and Shamli (6.05) blocks. It shows a very uneven distributional pattern.

Construction materials, are placed on 8th rank in the district. As the main raw material for the industry is clay which is ubiquitors in the area. Brick kilns are, therefore, located more or less uniformaly. Muzaffarnagar

block has the highest per centage of labour in this industry (36.20) followed by Charthawal (18.34), Shahpur (10.65), Baghara (8.10), Kairana (7.21) and Budhana (6.50). The remaining 13 per cent labour is found distributed in Purquazi, Shamli, Kandhala, Jansath and Morana blocks. The brick kilns are highly concentrated in northern and western part, along Rurkee, Saharanpur, Shamli and Budhana roads which are radiating from Muzaffnagar city. They are sparsely distributed along the river rine tracts of Ganga-Khadar where people use mud and grasses instead of bricks for building their bouses.

Cold storage and ice factories are located in only six blocks. The distributions of labour reveals their higher concentration at Muzaffarnagar, Shamli and Khatauli block of the district having percentage shares of 49.41, 30.00 and 8.23 respectively. The higher concentration of cold storages in Muzaffarnagar blocks is due to the high production of potato.

Distillery and blending manufacturing industry has only two factories in large-scale sector in the district. They are located at Shamli and Khatauli urban centres due to the presence of Sugar mills in these centres. Moreover, molasses is the by product of sugar mill which is used in the manufacturing of alcohal. Therefore, distiallery and blending units has a close relation with sugar cane industry.

Engineering industry. is found distributed in ten urban places namely Muzaffarnagar. Shamli. Budhana. Jansath. Khatauli. Kairana Charthawal. Kandhala. Thanabhavan and Un. with the labour percentage share of 45.05. 17.70. 11.99. 7.55. 7.29. 6.25. 1.04. 1.04 and 1.04 respectively. The distribution of labour records its high concentration in Muzaffarnagar. Shamli. Budhana and Jansath due to the developed industrial infrastructure and market.

The wooden based products are evenly distributed in the district. The patterns of labour distribution reveals its concentration at Shamli and Muzaffarnagar urban centres. Besides. demand and market facilities push it to concentrate in these two centres.

Rubber products manufacturing industry is found in four blocks namely Shamli. Kairana. Thanabhavan and Muzaffarnagar. The highest percentage of labour force (75.24) is found in Shamli block.

Oilseeds and fibres. and leather products have their high concentration in Muzaffarnagar block. The other types of agro-industries namely. cotton textiles. fertilizer and pesticides. confectionary. woollen textiles and cattle-feeds are found scattered over the entire region. All these types of agro-industires are located mainly at urban centres. Oilseeds. fertilizers. and confectionary are highly concentrated in Muzaffarnagar block as Muzaffarnagar block has the highest percentages of labour force. Woollen textile is concetrated in Shamli block as Shamli has the highest

percentage (78.89) of its labour force. Leather products industry is found in Kandhala block of the study area.

PATTERNS OF AGRO-INDUSTRIALISATION :

In order to findout the patterns of agro-industrialization (a) number of agro-industrial units. (b) labour and (c) capital investment patterns have been taken up at block level in Muzaffarnagar district. Industrialization pattern have been various from capital, labour and number of agro-units point of view and a final composite map is to show the original patterns of agro-industrialization.

Pattern of the Number of Agro-Industrial Units :

The number of factories is one of the measures to assess the level of industrialization. At block level Muzaffarnagar block has 926 agro-units (41.79 per cent) out of 2204 (Converted figure into small-scale equivalent)of the district. Table 6.4 shows that Muzaffarnagar block has 15 large-scale agro-industries out of 28 units of the district. the total number of small-scale and tiny-scale agro-units in this block are 134 and 1059 respectively. Shamli block has the second largest number of agro-units (21.05 per cent) followed by Khatauli (11.75). Charthawal (4.85). Jansath (3.99) Kairana (3.27) and Morana (2.99 per cent) blocks. It may be noted that half of the blocks of the district namely, Muzaffarnagar, Shamli, Khatauli, Chartawal, Jansath, Kairana and Morana Comprise 90 per cent of the total agro-industries

of the area. Un block has 17 agro-units followed by Baghara, Shahpur, Thanabhavan Kandhala, Purquazi and Budhana blocks with 24, 26, 35, 38, 41 and 44 respectively.

TABLE - 6.4

THE NUMBER OF AGRO-INDUSTRIAL UNITS , 1989.

S.NO	BLOCKS	No.of Agro-Industrial Units				Percentage	Comulative Percentage
		Tiny	Small	Large	Converted figure in small-scale equalent		
1.	Muzaffarnagar	1059	134	15	926	41.71	41.79
2.	Shamli	560	92	7	464	21.05	62.84
3.	Khatauli	816	26	4	259	11.75	74.59
4.	Charthaval	511	36	1	107	4.85	79.44
5.	Jansath	458	69	-	88	3.99	83.43
6.	Kairana	826	38	-	72	3.27	86.70
7.	Morana	102	12	1	66	2.99	89.68
8.	Budhana	418	27	-	44	2.10	91.79
9.	Purquazi	304	29	-	41	1.86	93.69
10.	Kandhala	425	21	-	38	1.72	95.37
11	Thanabhavan	313	21	-	35	1.59	96.56
12.	Shahpur	452	8	-	26	1.18	98.14
13.	Baghara	410	8	-	24	1.09	99.23
14.	Un	226	9	-	17	0.77	100.00
	Total	6880	530	28	2204	100.00	-

Source : Directory of Industries, District Industries Centre. Muzaffarnagar, 1989
Office of the Inspector of Factories, Muzaffarnagar, 1989.

The distribution of agro-industries is depicted in (Fig. 6.4). The figure shows that the eastern part of the district has high concentration of industries whereas the western part records sparse distribution.

Patterns of Labour Distribution :

The significane of industrilization is not viewed

MUZAFFARNAGAR DISTRICT

PATTERNS OF AGRO-INDUSTRIALIZATION AS INDICATED BY THE NUMBER OF AGRO-INDUSTRIAL UNIT, 1989.

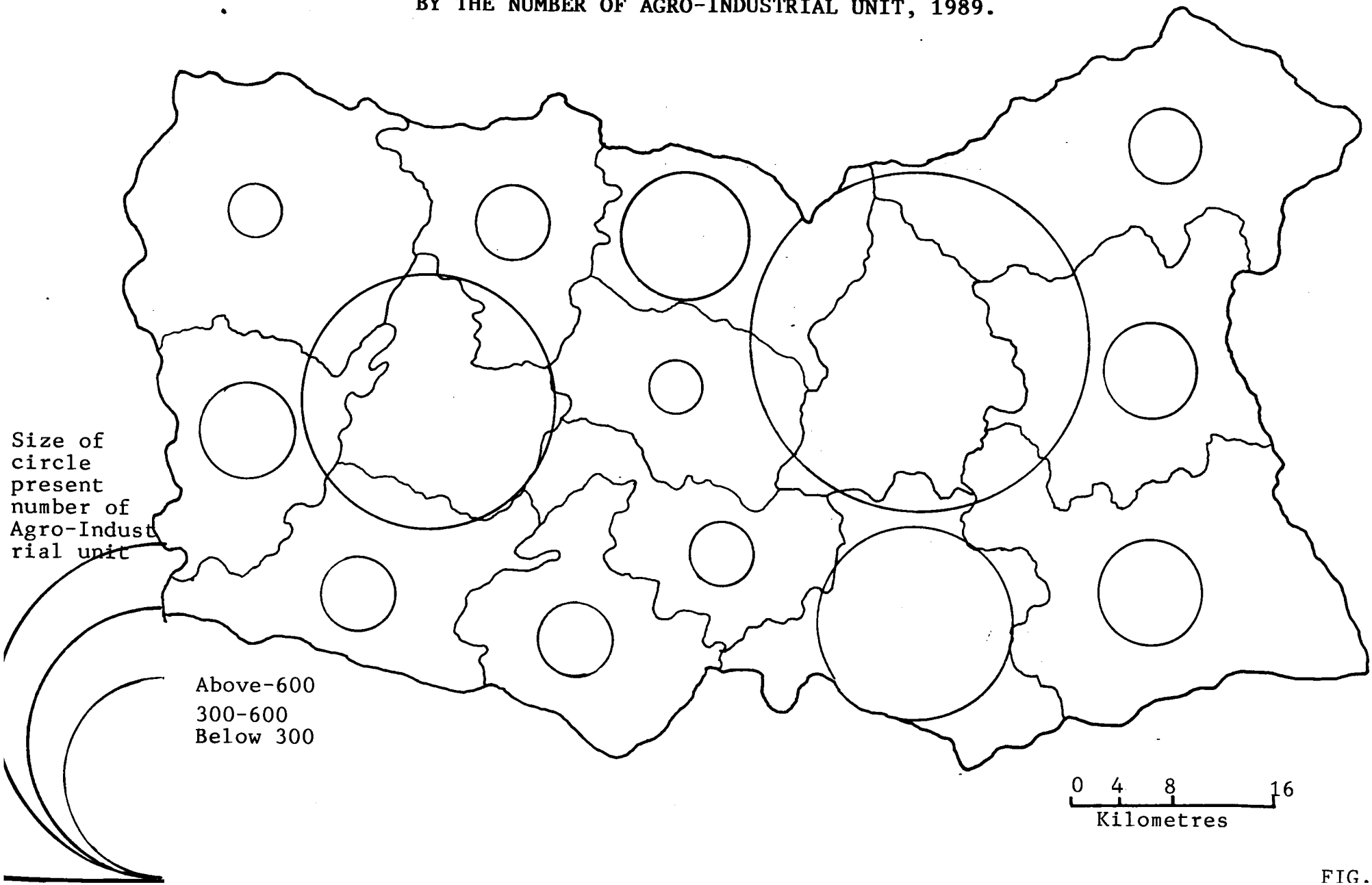


FIG. 6.4

as producer economic activity but also as an employment generating economic activity. Any industry thus assumes added importance if it is a good employer too. Agro-industrialization pattern has, therefore, been mapped from employment size of industrial places.

From the point of view of labour Muzaffarnagar block after Morana (18.04 per cent) stands at second place. Shamli (13.34), Khatauli (10.92), Jansath (9.86), Charthawal (8.29) and Kairana (5.18) percent of labour share of the total labour force. 2289 (4.38), 2071 (3.96), 1504 (2.97) and 1019 (1.95 per cent) labour force have been recorded in Budhana, Purquazi, Thanabhavan and Shahpur blocks respectively. The lest number (1.08 per cent) has been noted in Un block (Table 6.5).

Table - 6.5

LABOUR SIZE OF AGRO-INDUSTRIES, 1989

S.NO.	Blocks	Labour	Percentage	Cumulative Percentage
1.	Morana	9399	10.04	18.04
2.	Muzaffarnagar	8651	16.55	34.59
3.	Shamli	6971	13.34	47.93
4.	Khatauli	5707	10.92	58.85
5.	Jansath	5156	9.86	68.71
6.	Charthaval	4543	8.69	77.40
7.	Kairana	2709	5.18	82.58
8.	Budhana	2289	4.38	86.96
9.	Purquazi	2071	3.96	90.92
10.	Thanabhavan	1504	2.87	93.79
11.	Shahpur	1019	1.95	95.74
12.	Kandhala	861	1.64	97.38
13.	Baghara	805	1.54	98.92
14.	Un	565	1.08	100.00
	Total	52250	100.00	

Source :Directory of Industries , District Industries Centre, Muzaffarnagar (1989).
Office of the Inspector of Factories (1989).

MUZAFFARNAGAR DISTRICT

PATTERNS OF AGRO-INDUSTRIALIZATION AS INDICATED BY THE AGRO-INDUSTRIAL LABOUR, (1989)

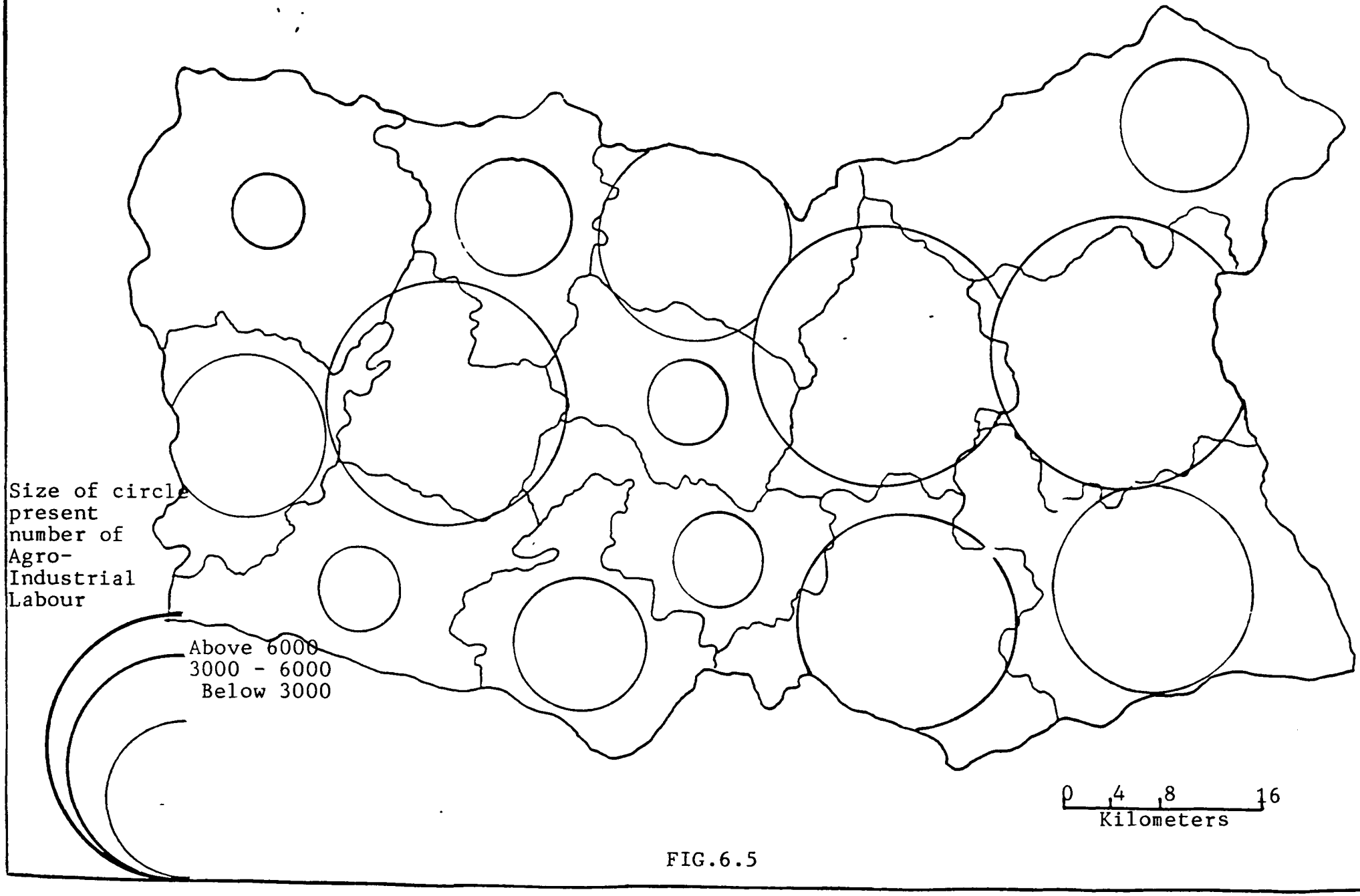


FIG.6.5

The figure 6.5 showing the spatial pattern of labour size distribution again shows almost similar patternas that of the patterns of number of agro-units in the study area. In comparision to the map of number of agro-units, the engaged labour size distribution pattern shows concentration of labour in Morana block. Although Morana block stands at seventh rank from the point of number the point of number of agro-units but still it occupies first rank in labour size distribution due to the location of one large-scale sugar mill unit which provided employment to 733 persons during 1988-89 crushing season.

The following conclusion may be drawn :

(1) In comparison to the pattern of agro-units, labour distribution pattern does not shows so much variations, for instance, only one block, Muzaffarnagar recorded 41 percent of agro-units and enjoys first rank, whereas Morana block which has occupied first rank, comprises only 18.04 percent labour of the district.

(2) The labour size distribution shows, its concentration in two different parts of the district one like a belt which started from the middle of the north boundry directing to south-eastern corner, covering Charthawal, Muzaffarnagar, Morana Khatauli and Jansath blocks, and another foremost middle west parts of the study area.

(3) It can be emphasized that the labour size distribution, more or less, has been governed by the spatial distribution pattern of gur-khandsari and sugar industry, and brick kilns, because these two types of agro-industries are labour intensive.

Pattern of Capital Investment:-

Capital investment of agro-industries is depicted in table 6.6. It can be seen that there is a high variation in capital investment at block level in the region. Muzaffarnagar block ranks first with an

investment of 29.59 percent followed by Shamli. Morana. Khatauli. Kairana and Charthawal with an investment of 26.03. 16.54. 14.66. 3.33 and 3.20 per cent respectively. Jansath (1.84 per cent and Thanabhavan (1.63) blocks stand at seventh and eight. place in the investment of capital in agro-industries. Purquazi. Budhana. Kandhala. Shahpur and Baghara have less investment in the agro-industries. the least investment is recorded by Un block. More than half of the total investment has been made in two blocks of Muzaffarnagar and Shamli (Table 6.6).

TABLE - 6.6

CAPITAL INVESTMENT OF AGRO - INDUSTRIES. 1989

S.NO.	Blocks	Capital Investment (loss of rupees)	Percentage	Cumulative Percentage
1.	Muzaffarnagar	3126.73	29.59	29.59
2.	Shamli	2754.99	26.03	55.62
3.	Morana	1751.14	16.54	72.16
4.	Khatauli	1551.76	14.66	86.82
5.	Kairana	342.84	3.23	90.05
6.	Charthaval	338.99	3.20	93.25
7.	Jansath	194.72	1.84	95.05
8.	Thanabhavan	172.63	1.63	96.72
9.	Purquazi	100.94	1.63	96.72
10.	Budhana	81.54	0.95	97.67
11.	Kandhala	71.10	0.77	98.44
12.	Shahpur	37.38	0.35	99.46
13	Baghara	31.06	0.29	99.75
14.	Un	26.70	0.25	100.00
	Total	10582.52	100.00	

Source:- Directory of Industries. District Industries Centre. Muzaffarnagar. 1989
Office of the Inspector of FActories. Muzaffarnagar. 1989.

It is clear from the above distribution that the four blocks where in the capital investment is the largest

are Muzaffarnagar, Shamli, Morana and Khatauli. These four blocks have capital investment beyond comparison to other blocks of the study area. the high capital investment in these four blocks is due to the concentration of large-scale agro-industries in their territory and moreover, these four blocks comprises the 27 large-scale agro-industries out of 28 present in the district. Therefore, it may be concluded that the pattern of large-scale agro-industries play an effective role in order to determine the pattern of capital investment in the study area.

Fig. 6.6 reveals that the high concentration of capital investment is in two blocks of the district, namely, Muzaffarnagar and Shamli. As indicated by the capital investment pattern the main axes along which agro-industrialization has occured next to Muzaffarnagar is on both sides of the road leading 18 Morana and Meerut. This is the Major corridor of agro-industrialisation exntending from Muzaffarnagar in the study area.

Second important extension of agro-industrialisation corridor has occured in the core of the western part of the district consisting Shamli and Kairana blocks.

The following conclusion may be drawns from the table and map of the pattern of capitals investment:

(1) The largest town i.e. Muzaffarnagar has the largest capital investment.

(2) The blocks having large-scale agro-industries consume 90 per cent of the capital investment. Therefore,

MUZAFFARNAGAR DISTRICT

PATTERNS OF AGRO-INDUSTRIALISATION AS INDICATED BY THE AMOUNT OF FIXED CAPITAL, 1989.

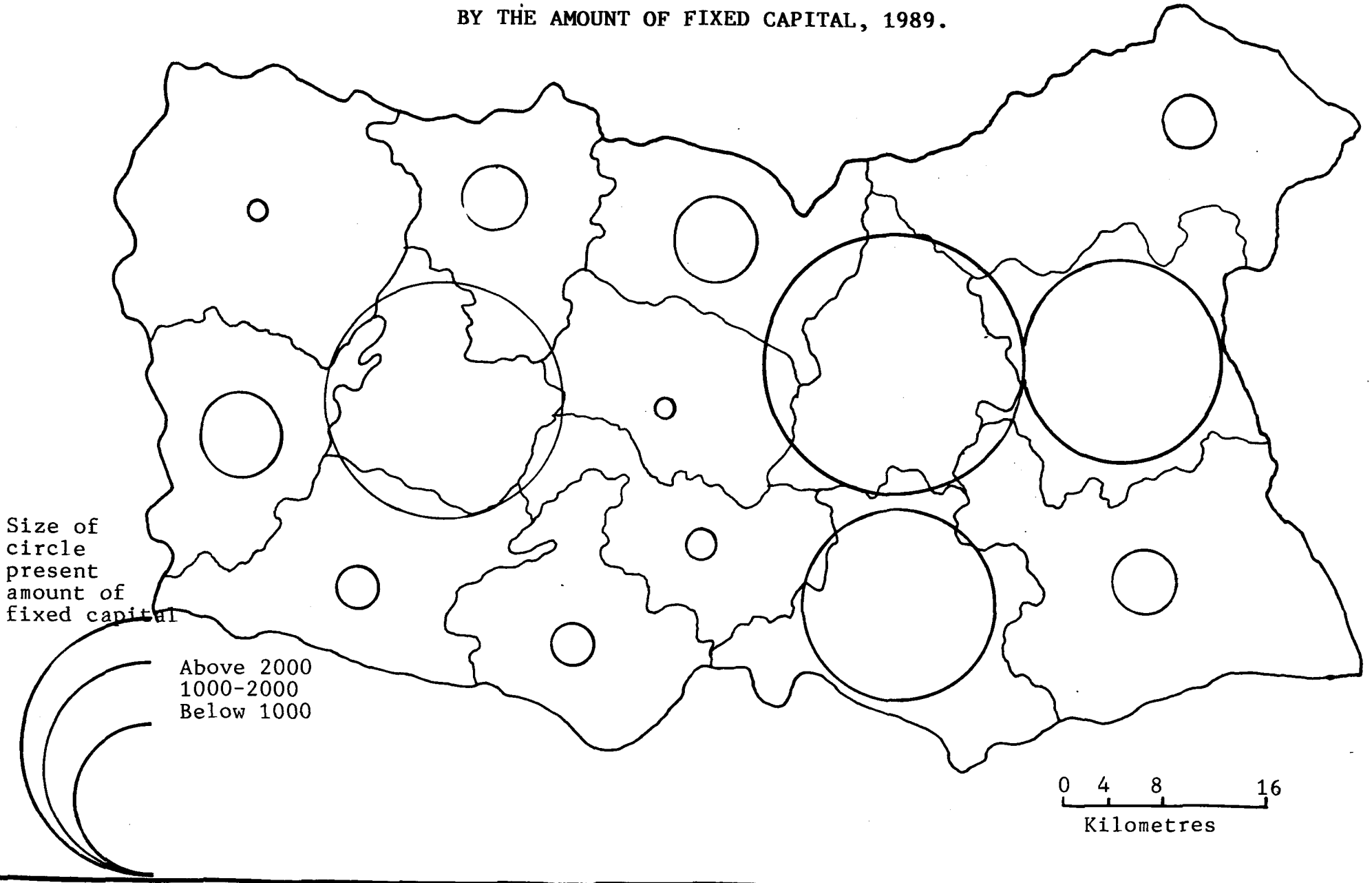


FIG. 6.6

large-scale sector has a crucial role in order to determine the level of capital investment.

(3) Though the capital investment pattern is the same as demostrated by the number of agro-industrial units and labour size distribution pattern, the relative significance of the blocks is different which is mainly explained by the nature of the agro-industries. Blocks having intensive capital investment industries are more significant as compared to labour-intensive industries. Though the capital investment distribution pattern is different from the labour size distribution but the general pattern is again the same.

It would be appropriate now to compare all the three kinds of pattern shown in three separate maps. It is therefore, obvious that the three kinds of distribution are different from each other but in broad aspect, there seems to be some similarity. However, the three different ways so mapping agro-industrialisation pattern is important in one way or the other. The number of agro-manufacturing industries shows the appropriateness of a place for attracting various kinds and scales of industries. Labour size is important in developing societies and in countries where government take responsibility of social welfare. From this point of view the labour size distribution is very important. While the capital is the index for showing economic size of the industries is considerably governed by the investment size.

General Pattern Of Agro-Industrialization:-

The pattern of agro- industrialization has been derived from a composite index devised on the basis of the number of agro-industrial units, labour size distribution and the pattern of capital investment. the absolute figures

MUZAFFARNAGAR DISTRICT

LEVELS OF AGRO-INDUSTRIALIZATION, (1989)

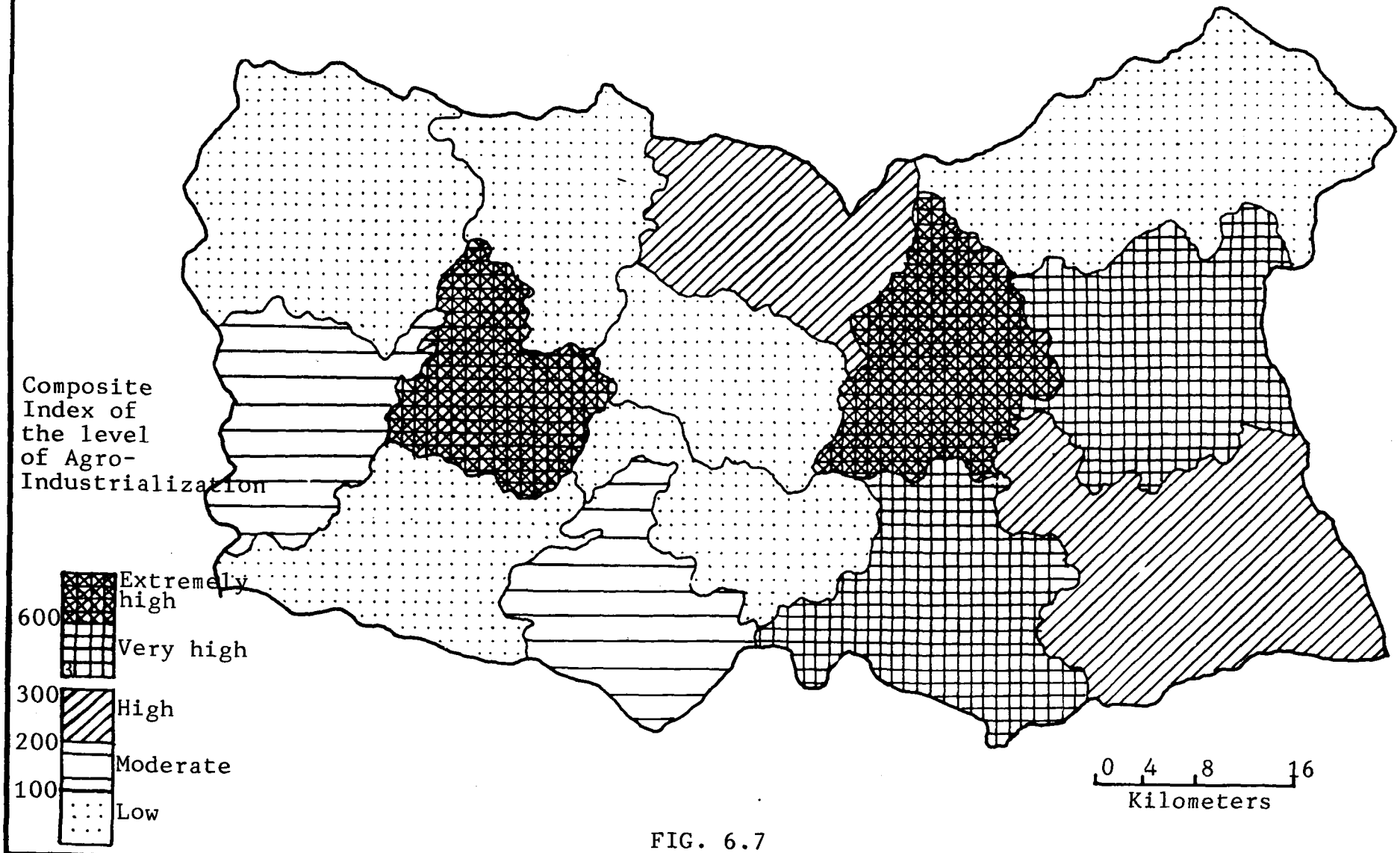


FIG. 6.7

given in previous tables in this chapter have been converted into reduced scores and their addition shows the composite index of agro-industrialization (Table-6.7). The composite scores are devided into five grades of extremely high, very high, high, moderate and low.

Fig. 6.7 reveals that extremely high level of agro-industrialization is found in two blocks of the entire districts namely, Muzaffarnagar and Shamli with their individual amounts of composite scores are 1236.66 and 845.99 respectively. They are situated apart and fail to constitute any region. Muzaffarnagar block lies in the centre of the eastern half, where as, Shamli in the centre of the western half of the district. Figure shows that the eastern half of the district has a very high and high level of industrialization whereas, western half of the district, (except Shamli block), has moderate and low levels of agro-industrializations. The map showing the levels of the agro-industrialization makes it clear that very few or limited area is capable of attracting industries and such places must have some reasons for attractiveness. The reasons for extremely high level of industrialisation in the blocks of Muzaffarnagar and Shamli are :(i) they are big urban centres followed by large market; (ii) These blocks are well linked to Meerut and Delhi in the south and Saharanpur in the north

TABLE - 6.7

LEVELS OF AGRO-INDUSTRIALIZATION, 1989

S.NO.	Blocks	Scores reduced at 100			Composite Scores
		No.of units	Labour	Capital Investment	
1.	Muzaffarnagar	588.23	231.79	413.64	1233.66
2.	Shamli	294.75	186.78	364.46	845.99
3.	Khatauli	164.52	152.91	205.28	522.71
4.	Morana	14.92	251.83	231.66	498.41
5.	Charthawal	67.97	121.75	44.84	234.56
6.	Jansath	55.90	138.15	25.76	219.81
7.	Kairana	45.73	72.58	9545.35	163.66
8.	Budhana	27.95	61.33	10.78	100.06
9.	Purquazi	26.04	55.49	13.35	94.90
10.	Thanabhavan	21.59	40.29	22.83	84.71
11.	Kandhala	24.13	23.06	9.40	56..59
12.	Shahpur	16.51	27.30	4.94	48.75
13	Baghara	15.24	21.56	4.10	40.90
14.	Un	10.79	15.13	3.53	29.45

Source:- Directory of Industries, District Industries Centre, Muzaffarnagar, 1989
Office of the Inspector of Factories, Muzaffarnagar, 1989.

by road and railway networds; (iii) they have a developed industrial infrastructural facilities. the very high level of industrialization has been noted in two blocks. the category includes the blocks having composite reduced scores ranging from 300 to 600. Khatauli (522.71) and Morana (498.41) blocks come in this category. They also do not make any distinct region. Though they fall in the eastern part of the district. The development and concentration of Khandsari and Sugar industries are responsible for its very high level of industrialization.

The high level of agro-industrialization includes two blocks namely Charthawal and Jansath. This grade ranges

from 200 to 300. These two blocks are also situated in a scattered nature and fails to constitute any region. Charthawal block lies in the north central part whereas, Jansath in the south east corner of the district. Concentration of the Khandasari industries in these two blocks fairly illustrates its high level of agro-industrialization. the moderate category ranges from 100 to 200 and comprises Kairana and Budhana blocks. Both blocks fall in the western part of the district. these two blocks have the potential for the development of the agro-industries.

The low level of industrialization has a composite score of less than 100. Six blocks (Purquazi, thanabhavan, Kandhala, Shahpur, Baghara and Un) of the district fall in this category. Five blocks make a contiguous region in the western part of the district. They sorround the extremely high block of Shamli. The sixth block i.e. Purquazi lies separately in the northeast corner of the district. The belt of low level of agro-industrialization separates the extremely high blocks from each other. So there is a need for a definite policy which can promote the regions which are poor in agro-industrialization and can maintain the standard of comparatively rich agro-industrialized regions.

INDUSTRIAL DEVELOPMENT - THE POTENTIAL

While efforts are, no doubt, to be made to diversity the industries in the district at the same time a

full utilisation of the capacities that already exist deserves equal attention. Here improved availability of raw materials, finance and power will help substantially. In case where demand is a major inhibiting factor, one expects the situation to improve with the generalrevival of the economy.

The need is urgent to utilise effectively the subsidised infrastructure built up in the industrial estates. Provision of common service facilities is important. The improvement in the power situation, especially in recent months, is on encouragingfactor though the entrepreneurs are facing its higher cost.

The raw material situation also deserves close scruting. A careful appraisal of the real capacities in the dunitsis to be undertaken to provide a second base for allocation of raw materials to them. Apart from ensuring correct and efficient raw material utilization , this will also help in the effortat mobilisation of resources.

Special attentionshould be given to the modernisation of the existing units, especially the Khandsari units. Vast scope exists for improving yield in these units through modernisation and improvement in the production process. Quality consciousness has to be promoted and the problem of availability of skills needs to be takcled more effectively. At present these units face difficulties in aranging sutable technical personnel such as sulphurman or bhatiman. There is also need for minimising

fuel loss in this sector through proper designing of the "bhati." The feasibility of establishing a khandsari development centre in Muzaffarnagar needs to be examined in this connection

INDUSTRIAL POSSIBILITIES:-

Sugarcane forms the backbone of the district's industrial sector. During the next few years sugarcane production is likely to exceed 111 lakh metric tonnes. though there are 5 sugar mills. their capacity is insufficient to crush all the cane of a season. Often the crushing season is extended despite lower recovery of sugar. Scope exists for expansionof capacity in this secotr. At least one more unit could be considered to crush 2,000 tonnes of cane per day on an investment of Rs.100 million. providing employment to 800 to 900 persons. The power requirement will be around 300 KV.

The sugar milks. as also the khandsari and the gur units.produce large quantitites of bagasse. now used as boiler . feed. By providing alternate fuel to the units this bagasse can perhaps be released for another uses. This would.of course. neccessitate modification in the boiler feed arrangementsin the various units.Availabillity of fuel. and equally important. their coasts. have naturally to be taken into account in such a shift. A possible alternative use for bagasse lies in the manufacture of particle bords. A better alternative would be to consider the feasibility of utilising it in newsprint manufacture. This is an area worth

examinatiosn in Muzafarnagar city.

Manufacture of Sulphur rolls which ave in great demand in the district is another feasible area of exploration. Two units could be set up in Muzaffarnagar each with providing employment to 10 persons. The units may require on investment of Rs. 350,000 each.

Another potential avenue is supply of sugar mill machinery and parts. The items that could be considered are can crushers, contrifugals, loaders, slat, knives, filter press etc.

Twounits could be considered to manufacture cane crushers at khatauli, each giving an employment to 30 persons. Each unit will require an investment of Rs. 350,000 to Rs. 400,000. Power requirement for each will be 15 H.P.

Two units of contrifugal pumps with acsacity of 1000 pumps each with an investment of Rs. 100,00 giving an employment of 8.

Manufacture of cane unloaders, feeder tables and other machinery is a possibility at khatauli where one unit could be set up with an investment of Rs. 600,000 having an employment potential sdof 30 to 40. tne power requirement will be around 35 H.P.

Manufacture of weighing equipment is a feasible area of operation, 15 be considered in Muzaffarnagar. An investment of Rs. 200,000 will be required for a unit with an employment potential of 20 and a connected load of 15 H.P.

In agriculture, introduction or modern techinques and use of improvved implements have gonea long way. Tractors, trailers and disc harrous are used on a airge scale. Manufacturingt of agricultural implements is a feasible area of operation.

The farmers use bullock carts fitted with boogie rims and tyres which are again manufactured in large quantities in the district. The manufacture of boogie carts, pumpsets, agricultural implements and tubewell accessories has a large potential.

Two units could be set up for making harrows, levellers threshers, etc., each with an investment of Rs. 100,000 and an employment of 5. The units could be set up at Shamli and Khatauli. ADU hubs, tube well accossories and electric motor are feasible areas of production. One unit could be set up at Shamli on an investment of Rs. 200,000 and an employment of 7.

Manufacture of PTO pulleys is another possibility. Units may be set at Shamli and Khatauli each with an investment of Rs. 200,000 and an employment of 15.

Tractor repairs at Shahpur is another possisbility an an investment of Rs. 100,000 and an employment of 8. The power requirement would be around 13 H.P.

The traditional skills available in the district for blanket weaving at Mirapur need to be aorganised effectively. A finishing plant also needs to be set up have.

The handloom and powerloom industry in Kairana

needs to be organised efectively and thew skill available locally could be utilised properly. A design centre needs to be developed and production organised for export.

A fruit preservation unit may be considered at Shamli on an investment of Rs. 50,000.

Production of cycle tyres and tybes is another possibility for which one unit may be considered in Muzaffarnagar with an investment of Rs. 1 millionand an amployment of 40 to 50. The power requirement will be around 70 H.P.

The utilization of melasses for manufacture of oxalic acid is another possibility.

Bone mill is another possibility. One unit may be considered at Jalalabad on an investment of Rs. 200,000

CONCLUSIONS

Present study reveals that surplus agricultural production, infrastructural facilities, market and urban centres are the leading factors of agro-industrialization in Muzaffarnagar district.At the ultimate base, however , lies the physical and human resources of the area . The level of developement of cultural resources nature of human and physical resources vary spatially. It is the close understanding of these resources upon which the future industrialisation alone can be based .

Among physical factor soil provides the foundation of all economic development .Quality of soil is reflected in the industrial and economic landscape of the region. Areas of sandy soils, as along the river courses, are areas of little hope. In agricultural areas soils help in the production of commodities for human needs and materials for factories and smaller enterprises.

Favorable climatic conditions and sufficient surface or ground water supply, helped in the specialization of a variety of agricultural crops attract irrigation, fertilizers, machanization, transport facilities and sequences growth regenerative character of land as they can pay for them and earn more from them. A spiralling process results in the increasing specialization of crop production whose surpluses find trade channles of industrial processing.

Specialization is indicated by the part of total sown area (T S A) claimed by a crop and by its productivity. It must produce surplus over local consumption. If the specialized crop is industrial, it is indicative of an area

well set on the path of industrilization. In case of its being a commercial or a foodgrains surplus crop. industrialization of the area may take a longer time. In the study area. sugarcane with 37 percent of T.S.A.. is more specialized than wheat (with 39 percent of T.S.A.) for wheat output is largely consumed as staple food leaving relatively little for wheat based factory-level industries. Paddy with 8 percent of the T.S.A. is also marginally surplus for its lessor local consumption.

Muzaffarnagar. Khatauli. Jansath and Shamli blocks are highly agricultural infrastructural have specialize in agricultural of different crops. Jansath. Khatauli and Morana blocks. forming a belt in south eastern corner. are intensive sugarcane producer. Wheat and pulses are intensively produced in Un. Purquazi and Khatauli blocks and paddy in Un and Thanabhavan. Sugarcane producing core area comprises of Jansath. Khatauli. Morana and Purquazi blocks with annual sugar production potential of 2.62.000 metric tonnes (at 10 percent recovery rate) which is 36 percent of the district's total potential. Annual surplus of wheat in Un block is 29.560 metric tonnes.Purquazi. Jansath. Thanabhavan and Charthawal also produce some surpluses of crops.

Commercial milk production is on the increase mainly by folder based cattle raising. Animal hides and bones may support some industries also.

The empirical enquiry into the nature of the levels of agro-industrial development of the study area reveals that the size of the market governs the level of

specialization of crop that supplies raw material to an industry. It is observed that the market (demand) of agro-raw materials may change secularly by technological change or by a change in social needs. Surplus manufactured production flows to central places and the trading system that export it evolves. Traders find new markets and level of manufacturing rises to small scale and then to large-scale factories concentrating along road-sides. Large-scale manufacturing agro-units finds towns located in raw material areas as suitable location. Mainly backward linkages effect (input provision) are visible mostly at the primate city to the area. The area gradually starts specialization in production of the raw material providing crop. Core industry grows gradually to specialize in the production. Reduction in costs both of materials and of manufactured products further helps in the gr wth of market. This process continues with increasing specialization of the area in core crop production and agro-industry based on it.

The nature of agro-industrial structure is dependent on and related to agricultural outputs. It gradually proceeds to inter-connected complex of industries concentrated mainly around the largest node in the region. In the study area, surplus agro-production, specialization in production and export explain subtantial part of the growth process of agro-industrial structure. The begining must assentially be made by surpluses of agricultural production. Structuraly growth of industries appears as the part of general evolution of economic development a symbiotic evolutionary process mainly as the function of

science, technology and capital.

The spatial distribution or agro-industrialization shows that almost all large scale and small-scale factories excluding khandsari and Gur-units (cane crushers) localize and concentrate in and around towns. Generally, they are known as 'footloose' industries. They includes industries like agricultural implements, sugar mill, paper and paper board, dairy, distillery, food processing, cane crusher machinary, fertilizers pesticides and rubber products. These industries are mostly located in town. Muzaffarnagar node leads in industrial concentration where industries are also found located along main road-radiating from the city. Large scale units are, located within 8-12 kilometers distance from the city along the main routes. A route running to the immediate largest town locates the largest number of factories and one to the smallest town, the smallest number. In smaller towns, however, large-scale units are located even within the town for example, the sugar mills at shamli and khatauli. The agro-industries are mainly attracted by various infrastructural and market facilities available at these urban centres.

The raw-material and transport oriented industry of the area is Gur-Khandsari (Cane crushers) which gets its life from the farms and in turn gives rise to many more industries evolving a more complex industrial structure, self-expanding and propelling. These manufacturing units are located in the countryside well-linked by transport lines and are mainly concentrated near smaller towns and larger villages. Though the precise location of khandsari

and Gur (Cane crusher) units is governed mainly by raw material, make an effort to remain along main roads and mostly along those leading to Muzaffarnagar city. This demonstrates the fact that their effort to be closer to infrastructure is not absent altogether. 'Demand door' industry like brick kiln units get very close location to the place of demand.

For identifying areal patterns of the location of factories, a generalized area is demarcated by villages having even a single unit. The primate city of the area, Muzaffarnagar, as the centre and roads emanating radially from it in 9 directions comprise the main agro-industrialized area and moreover, the road connecting Meerut has attracted the largest number of factories to about 13 kilometers' distance from Muzaffarnagar city. Industries are conspicuously absent in the wedges between these radial roads. The largest and the widest of such wedges is one between Muzaffarnagar - Shamli, Muzaffarnagar - Budhana roads in the south western sector of Muzaffarnagar Urban field.

The roads radiating from towns have the narrow corridors where in the intensity of industrialization is generally in proportion to the size of towns. It may, therefore, he inferred that an agricultural area evolves industrial area in 'star - shape' whose centre is made by the primate city and that the main route leading to the immediate biggest city has the greatest concentration of manufacturing units. The wider wedges remain the main areas of cottage industry for the absence of significant flow

lines and direct linkages to the biggest town. Physically negative areas (with poor natural endowments) which are mainly the riverside areas remain depressed in all respect and are unable to attract significant manufacturing units. Route linkages planning in relation to larger towns of an area, therefore, must be the fundamental requirement of any planned industrialization of an area along with, of course, other neccessary considerations.

Generally, there are two areas of rich agro-industrialization. One area lies in the south-eastern part and the other in the weste-central part of the district. The remaing north-eastern and western (except Shamli block) part are poor in agro-industrialization.

As demonstrated by the study area the roundation of industrialization is based on the surpluses of agricultural production. Thus the nature of agro-industrialization is based on the nature of agricultural production. The process of agro-industrialization is still in progress.

BIBLIOGRAPHY

1. Agrwal. R.R., et al., (1952): ***Soil Survey and Soil Works in U.P.***.National Geographers. Allahabad. Vol. I & II.p.16-19.

2. Appleton. J.H., (1960): ***The Geography of Communication in Great Britain,*** London. p.112.

3. Banerjee. B and Basu. D.,(1968): ***Evaluation of Indian Cotton Industry.*** Abstracts of papers of the International Geographical Union Congress. New Delhi.

4. Banerji. S., (1989) : ***'Regional Variation in the Consumption of Electric Energy in India.*** The Geography. Vol. XXXVI. No. January. A.M.U. Aligarh.

5. Barlowe. R., (1967): *Land Resource Economics. The Political Economy of Rural and Urban Land Resources use*: Prentice Hall. Inc., New York. p.228.

6. Bauer. P.T. & B.S. Yamey., (1974): *The Economics of Underdeveloped Countries.* p.235.S.C. Kuckhall. The Industrial Economy of India. Allahabad. p.3.

7. Bonavia. M.R.,(1954): ***The Economic of Transport,*** p. 3.

8. Buchanan. (1970) : ***The Transformation of Chinese Earth*** London. G. Ball. - & Sons. p. 312.

9. Basu. M. (1961) : ***Recent Problems Facing the Jute Industry in W. Pengal.*** Obs. 7.

10. Clark. Colin. (1967):***Population growth and Land use,*** (London).p.285

11. Callender. G.S., (1909) : Selection from the Economic History of the United State. p.345.

12. Dakshinamurti.C.,(1973):***Water Resources of India and their Utilization in Agriculture'.*** I.A.R.I..New Delhi.p.25.

13. Desai.D.K. and B.M. Mishra. (1966): ***Thechnological Change and Rate of Diffusion, Indian,*** Journal of agriculture Economics. Vol. XXI . p.p. 140-141

14. Dayal. P., (1968) : ***Sugar Industry in India,*** Abstracts of papers of 21st International Geographical Union Congress. New Delhi.

15. Dixit. K.R., (1963) : ***Growth and Distribution of Indian Paper Industry,*** National Geographical Journal of India, [illegible]3 and 47.

16. East. W. Gordan. (1962): ***An Historical Geography of Europe.*** London. p.392.

17. Fenelon. K.G., (1925): ***The Economics of Road Transport*** p. 10.

18. Fiscal Policy and Business cycles. p. 355

19. Fei. C.H. & G. Ranis. (1967) : ***Development of the labour Surpluses Economy,*** Theory and Policy. Scond print. p.155

20. Garegnani. P. (1984): ***Value and Distribution in the classical Economists and Marx.*** Oxford Economic Papers. 36.

21. Garner. B.l.. (1967) : ***Models of Urban Geography and Settlement Location*** in Models in Geography' edited by Chorley. R.L.. and Maggett. B. Methuen. p.320.

22. Glemic. E.A.. (1932): ***Gravity Anamolies in the Structure of Earth Crust,*** Memoirs of the Geological Survey of India. Professional paper No.27.Dehradun.

23. Gilbert.J..Walker.Rav Bahadur and Hem Raj. (1910):***Cold Weather Storms of North India.*** memoirs of Indian meteor.Department Vol.XXI.part VII.p.10.

24. Government of India. (1963-64) : ***Planning Commission India.*** New Delhi.

25. Ghose. B.C.. (1945) : *Industrial Location.* Oxford Pamphelet on Indian Affairs. No. 32. London. p.8.

26. Hirshman. Albert. O.. (1958):***The Strategy of Economic Development*** New Haven. p.190.

27. Hoyle. B.S.. (1973): ***Transport and Economic Growth in Developing Countries;*** The case of East Africa in

28. Hoyle. B.S. (Ed.). *Transport and Development* (London). p.50.

29. Hoyle. B.S.. (1974) : ***Spatial Aspect of Development.*** John Willy & sons. London. pp. 39.41.

30. Hodder. B.W. (1965) : ***Distribution of markets in Yorubaland - Scottis,*** Geographical Magazine. Vole. 81. No.1. April. p.48.

31. Iqbal. A. Badar. (1980) : ***Financing Agro-Industrial development in India*** - a study of U.P.

32. Iyengar. (V.V.) (1930) : ***The Mill Industry in Coimbatore.*** Journal of the Madras Geographical Association. p.283

33. Jorrett. H.R.. (1977) : ***Geography of Manufacturing*** London. p.2.

34. Johanson. (1970) : ***The Organisation of Space in Developing Countries.*** (Combridge mass. Haward University. Press: p. 183.

35. Kant. S & Dubey.K.N.. (1981): ***Spatial Structure of Administrative Units and Development Process*** paper persented in III Indian Geography Congress. New Delhi.

36. Krishnan. M.S..(1982): ***Geology of India,*** New Delhi.

37. Khan. M.N.. (1961) : ***Tea Industry of India.*** National Geographer. 4.

38. Kolb.A..(1971): ***East Asia: Geography of Cultural Region,*** Methuan & Co.. London. pp. 484-522.

39. Lokhnathan. P.S.. (1936) : ***Recent Trends in the Distribution of Cotton Mill in India.*** Journal of the Madras. Geographical Association. 11 p(3).

40. Locklin. D.P.. (1947) : ***Economics of Transportation.*** pp. 1-2.

41. Lowe. John C. and Moryadas. (1975): ***The Geography of Movement*** (Boston) p.5.

42. Mountjoy. Alan B.. (1971) : ***Industrialization and Underdeveloped countries.*** London. p.184.

43. Mukerjee. R.K. . (1968) : ***Man and Habitation,*** Bombay. p.122.

44. Smith. D.M.. (1971): ***Industrial Location,*** John Wiley & Sons. New York. p.69.

45. Marshall. Alfred .(1921): ***Industry and Trade,*** p.423.

46. Maurice. E.. (1969) : ***Crop Technology.*** Hutchinson Educational. London. F.A.O..FAP Arqicultural Year Book. UNESCO. Paris. 5. Marx. K.. (1867) :***Capital.*** Vol. I. (London). Vol.II (1885). and Vol.III (1894). (ed.) . Englas. London.

47. Mukerji. K.. (1976) : ***Industry-Agriculture Relationship Regional Development and Planning (Strategies and Case stdies),*** Vole. VIII. No. 1 & 2. Edited by K.G. Bagchi & C.R. Pande. December.

48. Meek. R.L.. (1962) : ***The Economics of Physiocracy,*** London.

49. Mehta. M.M.. (1958) : ***Location of Industries*** p. 30 : and T.R. Sharma -Locations of Industries in India (1958). p.17.

50. Michael. K. (1970): 'Why poor people stay poor. A study Urban Bias World Development. London. Tample Smith. p.59."ASPECT" Geographies

51. Majumdar. R.C. etal (1948):An advance History of India. London. p.899

52. Majid. S.A.. (1968) : ***Sugar Industry in Bihar.*** Abstracts of the papers of 21st International Geographical Union Congress. New Delhi.

53. Mahdev. P.D.. (1968) : ***Sugar Industry in India.*** Abstracts of papers of the 21st Internal Geographical Union Congress New Delhi.

54. Narayana Swami. S.. (1941) : ***The Cotton Mill Industry at Coimbtore.*** Calcutta Geographical Review. 3 .(2).

55. Nanvati M.B.. (1957):*Readings in Land Utilization.* The Indian Socity of Agricultural Economics. Bombay.p.2.

56. Nanvati and Anjaria. J.T.. (1951): *The Indian Rural Problems.* Vova & Co. Pub. Ltd.. Bombay.

57. Nandkarni B..(1980): ***The Indian Rurual Problems.*** Vora & company Bombay. Ltd. p.7.

58. Nanavati. (1951) : ***M.B. Readings in land Utilisation,*** The Indian Society of Agricultureal Economics. Bombay. p.2.

59. Oldhum. R.D.. (1917) : ***The Structure of Himalyas and the Gangetic Plain,*** memoirs of Geological Survey of India. Calcutta.

60. Pigon. A.C.. (1957) : ***Economics of welfare,*** p.74

61. Petty. Sir William. (1961) : ***Political Anatomy of Ireland.***London. In Economic Writings (ed.) Hull.

62. Proceedidngs of the Conference ***Agriculture and Industry.*** *'AREA'* Institute of British Geographers .1971. Vol. 3. No.4. p.250.

63. Proceedings of the Seminar.. ***Agriculture Industry Integration A Strategy for Rural Development*** held on 13-17 November. 1987 at M.M.H. College. Gaziabad.

64. Pei-kang Chang. (1974): Agriculture and Industrilisation. p.69. S.C. Kuchnal. The Industrial Economy of India. Allahabad. p.1.

65. Puranik V.G..(1970) : ***Agro-Industries and Economic Development, Agro-Industries in the Economy of Uttar Pradesh.*** Edited. Mohommad Mohsin. Faculty of Commerce. Aligarh. p.3.

66. Rao. R.H.. (1930) : ***A Note on the Home Industries of Coimbatore District,*** Journal of Madras Geographical Associaltion. 5 (2 and 3).

67. Rao. R.S. (1932) : ***Cottage Industries of Malabar.*** Journal of the Madras Geographical Association. 7 (3 and 4).

68. Rawat.D.S.. (1989) : Initial Agrarian Industrial structure-A case study of the Indian District of Muzaffarnagar. Geographical Observer. vol. 25. Meerut.

69. Raychaudhry.S.P. & R.R.Agarwal. (1963):***Soils of India*** I.C.A.R.. New Delhi.p.35-41.

70. Raychaudhry.S.P.. (1963):***Indian Soils their Classification, Occurrance & Properties.*** Vol. I.Government of India. New Delhi.

71. Rawat. D.S.. (1989):***District Planning for Industrial Development, History and impulses of Industrial Growth.*** C. W.P.. New Delhi. P.29.

72. Rangappa. K.. (1957) : ***Some Aspects of Small Scale and Cottage Industries in Mysore State,*** Geographical Review of India 11(3).

73. Ricardo. D.. (1817) : ***Principles of Political Economy and Texation*** 'Work'. Vol. I (ed.) P- Snaffa (1951).

74. Robbins . Lional.. (1955):***An Essay on the Nature and Significance of Economic Science,*** p. 1.

75. Spate.O.H.K.et al.. (1967): ***'India and Pakistan,***London. p. 305

76. Singh. A.L..S.F. Azam & S.N. Hashmi. (1988): ***Inter District Variations in the Development of Irrigation in Western Uttar Pradesh.*** National Geographer. Vol. XXIII. N.1. p.45.

77. Stamp. L.D..(1958): ***Asia a Regional and Economic Geography:*** London.

78. Santwani. M.T. & R.N. Sharma.(1979) : ***Agro - Industries :Concepts, Areas and Standarization.*** Agriculture and agro - industries Journal. Bombay. August. Vol. 12. No. 8. pp 11 - 15

79. Stavenhagen. R.. (1975):*Social Classes in Agricultural Societies.* (New York) Anchol books.

80. Savale. R.S.. (1966) : ***Technological Change in Agricultural Study of Sources and its Diffusion Efficiency of Sources and the Economic Factors Affecting the Adoption of Improved Practices*** Indian Journal of Agricultural Economics. Vol. XXII. p.199.

81. Sraffa P. (1961) : ***Production of Commodities by means of Commodites.*** Combridge.

82. Singh. A.K. (1970) : ***Interrelationships Between Agriculture and industries in U.P. Techniques of Analysis for Backward Region.*** Indian Journal of Regional Science. Vol. II. Number 1.

83. Singh. R.L. & S. Pannu (1957) : ***The Saryuper Plains. A Study in Agro-Industrial Relationships*** National Geographical Journal of India' Vole 3/3. 1 to 4.

84. Singh. J.P.. (1963) : ***Prospects of Textile Industries in Punjab.*** Indian Geographical Journal. p.15.

85. Smith. Adam. (1976) :***'An Enquiry into the Nature and Causes of the Health of Nations'.***(ed.) Cannan.

86. Santillon. R.. (1785) :- ***'Essay on the Nature of Commerce'.***

88. Tynaguncnko. V.L. (Ed.). (1973) :*Industrialization of developing Countries.* (Moscow).

89. Shirokow. G.K. 1973: ' Industrialization of India' Moscow. p.8.

90. Spate. O.H.K. Op.cit.p. 331 London. p.331.

91. Sharma. T.C.. & O.Coutinho.(1983): ***Growth of Irrigation and its Impact on Crop Land Use and Yield in Karnataka, 1960-1961 to 1976-1977,*** Annals of the National Association of Geographers India. Vol. II. No.2.

92. Sinha. B.N.. (1960) : ***Large Scale, Medium and Cottage Industires in Orrisa,*** Geographical Review of India. 21.

93. Tiwari. C.B. (1967) : ***Prospects of Small Scale Industries in Eastern Uttar Pradesh,*** Geographical Thought. 3(1).

94. Tiwari. R.N.. (1961) : ***Location of Sugar Mill.*** The National Geographical Journal of India. 4.

95. Tiwari. C.B. . (1968) : ***Sugar Industry in Eastern U.P..*** Abstracts of the papers of the 21st International Geographical Union Congress. New Delhi.

96. U.N. Econ. and Soc.. (1962) :***Council Transport, Development*** (New York).

97. United Nations Report. ***Process and Problems of Industrialization in Under Developed Countries.*** p.3

98. Voight. F.. (1967) : ***The Importance of the Transport System for Economic Development Process*** (Un Econ. Comm. for Africa. Addis Ababa.).

99. Wadia. D.N.. (1981).***Geology of India,*** New Delhi.

100. Wagner. P.. (1960) : ***The Human use of the Earth,*** Illinoise. p.207.

101. Williamson. A.V..(1925):***Irrigation in the Indo-Gangetic Plain'.*** The Geographical Journal.Vole. VIV. No2. p.145.

APPENDIX - 4.1

I-PART Z-SCORE VALUES OF EACH INDICATORS OF THE AGRICULTURE IN BLOCKS OF MUZAFFARNAGAR DISTRICT

S.NO.	BLOCKS	Irrigation		Urvark				TRACTOR	THRESHER	Fertiliser	Seed Depot	Bio Gas
		Cannals	Tubewe..	Nitrogen Phosphorus Potash	Harrow & Cultivator	Plough Wooden	Plough Iron					
		Z Score	Z Score	Z Score	Z Score	Z Score	Z Score	Z Score	Z Score	Z Score	Z Score	Z Score
1.	Muzaffarnagar	0.58	-0.21	1.28	0.79	0.05	0.94	1.22	-0.57	0.13	1.30	-0.53
2.	Baghara	-0.44	-0.03	-0.84	0.31	0.21	-0.19	-0.18	-0.53	0.77	-	2.17
3.	Charthawal	0.50	0.75	-0.55	1.07	-1.85	-0.76	-0.95	-0.49	0.13	-1.19	-0.57
4.	Purquazi	1.14	-1.01	-0.32	1.11	0.70	1.01	-0.36	-0.94	0.13	-0.56	-1.82
5.	Kairana	-0.91	-0.37	-1.15	-1.21	-1.81	-1.00	-1.37	-0.53	0.77	-0.56	-0.93
6.	Shamli	0.08	-0.98	2.46	-1.02	0.03	-0.11	1.45	0.59	-1.14	-0.56	1.69
7.	Thanabhavan	0.44	-0.13	-0.09	-1.53	-0.81	-0.96	-0.24	1.40	-1.78	0.68	0.04
8.	Un	-0.74	1.83	-0.22	-1.15	-0.44	0.36	1.53	0.31	-2.42	1.93	-0.57
9.	Khatauli	-0.24	1.11	1.15	2.06	0.81	1.58	1.09	1.95	0.77	-1.19	-0.57
10.	Jansath	0.50	0.85	.002	1.02	-.005	1.65	1.02	-1.12	0.13	1.30	0.46
11.	Morana	2.29	-1.46	-1.21	0.21	0.21	-0.2	0.04	-0.58	-1.75	0.77	-
12.	Budhana	-1.83	-1.35	-0.94	-0.53	1.81	-0.67	-1.07	0.08	0.77	-0.56	-.002
13.	Shahpur	-1.02	-0.32	0.25	-0.01	0.17	-0.67	-0.85	0.87	0.13	0.05	0.80
14	Kandhala	0.53	1.34	0.16	-0.19	1.34	0.04	-0.69	0.74	0.77	-0.56	-0.20

II-PART

UnNationalized Commercial B. Total	National B..Sahkari Somitva. other Nationalized B.. Rural B-inurban. Sahkari B-(urban-Rural). Bhumi vikas B:Rural Nationalized B.. Regional Rural B..Other Rural Banks	Markets Roads	Villages Electrified	Buyer and Cold Selar Sahkari	Storage	Total
Z-Score		Z-Score	Z-Score	Z-Score	Z-Score	
2.71		-0.36	-0.84	-0.40	1	- 6.093
-0.49		0.86	-	-0.60	-	- -0.7
-0.60		-0.15	-0.84	0.17	-	- -5.33
-0.14		-0.18	-0.84	0.71	-	- -137
-1.06		0.63	-0.84	-0.89	-	- -11.23
0.42		1.09	0.74	-0.89	+	- 3.85
-0.37		-0.08	0.74	-0.21	-	- -2.9
-0.49		-0.68	2.33	1.88	-	- 3.46
1.45		2.16	-0.84	1.88	+	- 13.74
0.88		1.69	0.74	1.25	+	- 10.38
-0.49		-1.39	-0.84	-0.16	-	- -4.73
-0.37		-1.04	-0.84	-1.08	-	- -7.11
-0.71		-0.61	0.74	-0.99	-	- -0.47
-0.71		-0.18	0.74	-0.65	-	- 2.48

APPENDIX 5.1

Blockwise Distribution of Markets According to Their Population Size

Block	Less than 10,000	10,000-20,000	20,000-50,000	50,000-10,00,00	above 1,00,000	Total No. of Markets
1	2	3	4	5	6	7
1. Muzaffarnagar	-	-	-	-	1. Muzaffarnagar	1
2. Shamli	1.Banat	-	-	1.Shamli	-	2
3. Kairana	-	-	1.Kairana	-	-	1
4. Khatauli	-	-	1.Khatauli	-	-	1
5. Kandhala	1.Alam	-	1.Kandhala	-	-	2
6. Thanabhavan	-	1.Thanabhavan				
		2.Jalabad	-	-	-	2
7. Purquazi	-	1.Purquazi	-	-	-	1
8. Budhana	-	1.Budhana	-	-	-	1
9. Jansath	-	1.Mirapur				
		2.Jansath	-	-	-	2
10.Charthawal	-	1.Charthawal	-	-	-	1
11.Morana	-	1.Bhokarheri	-	-	-	1
12.Un	1.Garhi Pukta	1.Un				
		2.Jhinjana	-	-	-	3
13.Shahpur	1.Shahpur	1.Sisauli	-	-	-	2
14.Baghara	-	-	-	-	-	-
Total	4	11	3	1	1	20

APPENDIX 5.2

PASSENGER VEHICULAR TRAFFIC FLOW IN MUZFFARNAGAR. DISTRICT.

Section of Routes	Daily Number of buses	Daily Number of passenger train	Total Bus equivalents consuming 1 train is equal to 20 buses.
Muzaffarnagar-Meerut	230	19	610
Muzaffarnagar-Saharanpur	60	19	440
Shamli-Saharanpur	65	12	305
Shamli-Barout	60	12	300
Muzaffarnaagar-Shamli	190	-	190
Muzaffarnagar-Rurkee	165	-	165
Shamli-Panipat	60	-	60
Muzaffarnagar-Budhana	55	-	55
Muzaffarnagar-Bijnor	50	-	50
Ramraj-Bijnor	50	-	50
Khatauli-Jansath	40	-	40
Khatauli-Mirapur	40	-	40
Mirapur-Ramraj	40	-	40
Khatauli-Budhana	35	-	35
Muzaffarnagar-Charthawal	32	-	32
Kairana-Khandala	30	-	30
Shamli-Jhinjhana	30	-	30
Charthawal-Thanabhavan	30	-	30
Jalabad-Gangoh	25	-	25
Muzaffarnagar-Barla	20	-	20
Barla-Deoband	15	-	15
Furquazi-Landhora	12	-	12
Bukherheri-Jansath	11	-	11
Mansurpur-Shahpur	10	-	10
Kairana-Jhinjana	10	-	10
Jhinjana-Un	10	-	10
Shamli-Garhipukta	10	-	10
Shamli-Budhana	10	-	10
Remaining routes (each)	<10	-	<10

Source : Private Data collection from various bus stops and Railway Time Table. 198.